

=> file home

FILE 'HOME' ENTERED AT 10:13:45 ON 10 OCT 2002

=> d his

FILE 'HCA, WPIX, JAPIO, JICST-EPLUS, COMPENDEX, AEROSPACE, ENERGY'  
ENTERED AT 08:54:44 ON 10 OCT 2002

L1 32453 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)  
L2 15421 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)  
L3 12299 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)  
L4 6494 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)  
L5 7206 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)  
L6 4810 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)  
L7 25029 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)

TOTAL FOR ALL FILES

L8 103712 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)  
L9 6646 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (ELECTROD## OR  
CATHOD## OR ANOD##)  
L10 9782 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (ELECTROD## OR  
CATHOD## OR ANOD##)  
L11 4077 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (ELECTROD## OR  
CATHOD## OR ANOD##)  
L12 388 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (ELECTROD## OR  
CATHOD## OR ANOD##)  
L13 1693 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (ELECTROD## OR  
CATHOD## OR ANOD##)  
L14 336 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (ELECTROD## OR  
CATHOD## OR ANOD##)  
L15 1178 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (ELECTROD## OR  
CATHOD## OR ANOD##)

TOTAL FOR ALL FILES

L16 24100 SEA (AREA OR AREAS OR SA OR S(W) A) (2A) (ELECTROD## OR  
CATHOD## OR ANOD##)  
L17 288 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (INTERCONNECT? OR  
SEPARAT!R?)  
L18 992 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (INTERCONNECT? OR  
SEPARAT!R?)  
L19 206 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (INTERCONNECT? OR  
SEPARAT!R?)  
L20 63 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (INTERCONNECT? OR  
SEPARAT!R?)  
L21 645 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (INTERCONNECT? OR  
SEPARAT!R?)  
L22 96 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (INTERCONNECT? OR  
SEPARAT!R?)  
L23 243 SEA (AREA OR AREAS OR SA OR S(W)A) (2A) (INTERCONNECT? OR  
SEPARAT!R?)

TOTAL FOR ALL FILES

L24 2533 SEA (AREA OR AREAS OR SA OR S(W) A) (2A) (INTERCONNECT? OR  
SEPARAT!R?)

FILE 'LCA' ENTERED AT 09:04:56 ON 10 OCT 2002

L25 13018 SEA RATIO OR RATIOS OR PROPORTION? OR COMPARE# OR  
COMPARING# OR COMPARISON? OR COMPARAB? OR RELATIV? OR  
RELATIONSHIP? OR DIFFERENTIAL?

FILE 'HCA, WPIX, JAPIO, JICST-EPLUS, COMPENDEX, AEROSPACE, ENERGY'  
ENTERED AT 09:05:51 ON 10 OCT 2002

L26 8 SEA L1 AND L9 AND L17  
L27 1 SEA L2 AND L10 AND L18  
L28 2 SEA L3 AND L11 AND L19  
L29 0 SEA L4 AND L12 AND L20  
L30 1 SEA L5 AND L13 AND L21  
L31 0 SEA L6 AND L14 AND L22  
L32 2 SEA L7 AND L15 AND L23

TOTAL FOR ALL FILES

L33 14 SEA L8 AND L16 AND L24  
L34 1 SEA L26 AND L25  
L35 1 SEA L27 AND L25  
L36 0 SEA L28 AND L25  
L37 0 SEA L29 AND L25  
L38 0 SEA L30 AND L25  
L39 0 SEA L31 AND L25  
L40 0 SEA L32 AND L25

TOTAL FOR ALL FILES

L41 2 SEA L33 AND L25  
L42 451 SEA (AREA OR AREAS OR SA OR S(W)A) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L43 520 SEA (AREA OR AREAS OR SA OR S(W)A) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L44 353 SEA (AREA OR AREAS OR SA OR S(W)A) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L45 14 SEA (AREA OR AREAS OR SA OR S(W)A) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L46 51 SEA (AREA OR AREAS OR SA OR S(W)A) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L47 35 SEA (AREA OR AREAS OR SA OR S(W)A) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L48 147 SEA (AREA OR AREAS OR SA OR S(W)A) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)

TOTAL FOR ALL FILES

L49 1571 SEA (AREA OR AREAS OR SA OR S(W) A) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L50 114 SEA L42 AND L1  
L51 26 SEA L43 AND L2  
L52 47 SEA L44 AND L3  
L53 9 SEA L45 AND L4  
L54 10 SEA L46 AND L5  
L55 6 SEA L47 AND L6  
L56 60 SEA L48 AND L7

TOTAL FOR ALL FILES

L57 272 SEA L49 AND L8  
L58 5 SEA L50 AND L25

L59 6 SEA L51 AND L25  
L60 9 SEA L52 AND L25  
L61 1 SEA L53 AND L25  
L62 1 SEA L54 AND L25  
L63 0 SEA L55 AND L25  
L64 6 SEA L56 AND L25  
TOTAL FOR ALL FILES  
L65 28 SEA L57 AND L25

FILE 'HCA, WPIX, JAPIO, JICST-EPLUS, COMPENDEX, AEROSPACE, ENERGY'  
ENTERED AT 09:23:51 ON 10 OCT 2002

L66 674 SEA (SIZE# OR SIZING# OR DIA# OR DIAM# OR DIAMET? OR  
RADIUS? OR RADII# OR REGION#) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L67 1028 SEA (SIZE# OR SIZING# OR DIA# OR DIAM# OR DIAMET? OR  
RADIUS? OR RADII# OR REGION#) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L68 753 SEA (SIZE# OR SIZING# OR DIA# OR DIAM# OR DIAMET? OR  
RADIUS? OR RADII# OR REGION#) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L69 12 SEA (SIZE# OR SIZING# OR DIA# OR DIAM# OR DIAMET? OR  
RADIUS? OR RADII# OR REGION#) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L70 83 SEA (SIZE# OR SIZING# OR DIA# OR DIAM# OR DIAMET? OR  
RADIUS? OR RADII# OR REGION#) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L71 25 SEA (SIZE# OR SIZING# OR DIA# OR DIAM# OR DIAMET? OR  
RADIUS? OR RADII# OR REGION#) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L72 118 SEA (SIZE# OR SIZING# OR DIA# OR DIAM# OR DIAMET? OR  
RADIUS? OR RADII# OR REGION#) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)

TOTAL FOR ALL FILES

L73 2693 SEA (SIZE# OR SIZING# OR DIA# OR DIAM# OR DIAMET? OR  
RADIUS? OR RADII# OR REGION#) (25A) (ELECTROD## OR  
CATHOD## OR ANOD##) (25A) (INTERCONNECT? OR SEPARAT!R?)  
L74 35 SEA L66 AND L1  
L75 41 SEA L67 AND L2  
L76 44 SEA L68 AND L3  
L77 4 SEA L69 AND L4  
L78 10 SEA L70 AND L5  
L79 11 SEA L71 AND L6  
L80 41 SEA L72 AND L7

TOTAL FOR ALL FILES

L81 186 SEA L73 AND L8  
L82 2 SEA L74 AND L25  
L83 5 SEA L75 AND L25  
L84 4 SEA L76 AND L25  
L85 1 SEA L77 AND L25  
L86 1 SEA L78 AND L25  
L87 2 SEA L79 AND L25

Crepeau 09/994,903

L88 5 SEA L80 AND L25  
TOTAL FOR ALL FILES  
L89 20 SEA L81 AND L25

L90 FILE 'HCA' ENTERED AT 09:33:47 ON 10 OCT 2002  
13 SEA L26 OR L34 OR L58 OR L82

L91 FILE 'WPIX' ENTERED AT 09:34:34 ON 10 OCT 2002  
9 SEA L27 OR L35 OR L59 OR L83

L92 FILE 'JAPIO' ENTERED AT 09:35:21 ON 10 OCT 2002  
15 SEA L28 OR L60 OR L84

L93 FILE 'JICST-EPLUS' ENTERED AT 09:35:47 ON 10 OCT 2002  
10 SEA L53 OR L61 OR L85 OR L77

L94 FILE 'COMPENDEX' ENTERED AT 09:37:02 ON 10 OCT 2002  
3 SEA L30 OR L62 OR L86  
L95 14 SEA (L54 OR L78) NOT L94

L96 FILE 'AEROSPACE' ENTERED AT 09:38:19 ON 10 OCT 2002  
8 SEA L55 OR L87  
L97 8 SEA L79 NOT L96

L98 FILE 'ENERGY' ENTERED AT 09:39:12 ON 10 OCT 2002  
13 SEA L32 OR L64 OR L88

FILE 'HOME' ENTERED AT 10:13:45 ON 10 OCT 2002

=> file hca


FILE 'HCA' ENTERED AT 10:13:57 ON 10 OCT 2002  
USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.  
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=> d l90 1-13 cbib abs hitind

L90 ANSWER (1) OF 13 HCA COPYRIGHT 2002 ACS  
136:404256 Solid polymer electrolyte **fuel cell**.  
Seki, Akira; Tarutani, Yoshio; Doi, Norifumi; Fukuda, Shinji  
(Sumitomo Metal Industries Ltd., Japan). Jpn. Kokai Tokkyo Koho JP  
2002151111 A2 20020524, 11 pp. (Japanese). CODEN: JKXXAF.  
APPLICATION: JP 2000-343949 20001110.  
AB The **fuel cell** has a stack of unit cells having a  
reaction unit, contg. a polymer electrolyte held between a cathode  
and an **anode**, held between an oxidant gas supplying  
**separator** and a fuel gas supplying **separator**;  
where both **separators** are made of stainless steel, and the  
**area** of the **separator** in direct contact with the

*relevant And date*

**cathode** and/or **anod** is 0.3-0.7 time the **electrode** surface **area**. The separator may also have boride or carbide exposes on its surface.

- IC ICM H01M008-02  
ICS H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST polymer electrolyte **fuel cell separator**  
**electrode** contact **area**; stainless steel  
**fuel cell** separator; boride stainless steel  
**fuel cell** separator; carbide stainless steel  
**fuel cell** separator
- IT **Fuel cells**  
(stainless steel **separator** with controlled  
**electrode** contacting **area ratio** for  
polymer electrolyte **fuel cells**)
- IT Borides  
(stainless steel **separator** with exposes borides and  
controlled **electrode** contacting **area**  
**ratio** for polymer electrolyte **fuel**  
**cells**)
- IT Carbides  
(stainless steel **separator** with exposes carbides and  
controlled **electrode** contacting **area**  
**ratio** for polymer electrolyte **fuel**  
**cells**)
- IT 302558-12-9 302558-49-2 428866-45-9 428866-47-1 428866-49-3  
428866-53-9 428866-55-1 428866-57-3 428866-59-5 428866-60-8  
(stainless steel **separator** with controlled  
**electrode** contacting **area ratio** for  
polymer electrolyte **fuel cells**)
- L90 ANSWER 2 OF 13 HCA COPYRIGHT 2002 ACS 
- 135:125060 **Fuel cells** and method for removing  
insulator films from metal separators. Higashiyama, Kiyoshi (Toyota  
Motor Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2001216978 A2  
20010810, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP  
2000-28619 20000207.
- AB The **fuel cells** have a stack of flat electrodes  
and metal **separators**, having protruded **areas**  
contacting the **electrodes**, where the electrodes have  
scratching members of required hardness and shape at **areas**  
contacting the **separators**, to remove insulator layer from  
a separator, when the electrode and the electrode slide against each  
other. Insulator films are removed from separators by using an  
external force to cause the electrodes and separators to slide  
against each other.
- IC ICM H01M008-02  
ICS H01M008-02; H01M004-86
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **fuel cell** separator insulator film removal
- IT **Fuel cell** electrodes  
**Fuel cell** separators

(**fuel cell electrodes** contg. hard  
**areas** of required shape for removing insulator films from  
 metal separators by sliding)

L90 ANSWER <sup>3</sup> OF 13 HCA COPYRIGHT 2002 ACS

135:109745 **Fuel cell** stack with cooling fins and use 10  
 of expanded graphite in **fuel cells**. Koschany,  
 Petra (Manhattan Scientifics, Inc., USA). PCT Int. Appl. WO  
 2001054218 A2 20010726, 16 pp. DESIGNATED STATES: W: AE, AG, AL,  
 AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE,  
 DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,  
 JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,  
 MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ,  
 TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ,  
 MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK,  
 ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN,  
 TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-EP438  
 20010116. PRIORITY: US 2000-PV176819 20000119.

AB For an improved cooling a **fuel cell** stack with  
 cooling fins extending around the periphery of the stack, the  
 section of the stack has a somewhat longitudinal shape. In detail,  
 the stack comprises: a plurality of **fuel cells**  
 elec. connected in series and having equiv. active section  
**areas** and circumferences, each **fuel cell**  
 comprising a laminate of layers, these comprising an electrolyte  
 membrane and catalyst, **electrode** and gas diffusion layers  
 the functions of which may be combined in any combination in  
 multifunction layers; end and **separator** plates delimiting  
 each cell; and cooling layers the cooling function of which also may  
 be combined with other layers in resp. multifunction layers, the  
 cooling layers each projecting beyond the circumferential outer  
 periphery of the laminate of the other layers thereby comprising an  
 inner active section area and a peripheral cooling fin area. For  
 extending the circumference of the active area and thereby the  
 section of the cooling layer and the area of the fins, the  
**ratio** of circumference and active area of the stack, defined  
 by the geometrical shape of the active area, extends the  
 corresponding **ratio** of a square active area. Also  
 described is the use of expanded graphite for one or several of the  
 following components of a **fuel cell**: bipolar  
 plate, electrode, and gas diffusion layer.

IC ICM H01M008-02

ICS H01M008-24; H01M008-04; B60L011-18

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** stack cooling fin; graphite expanded

**fuel cell** stack cooling fin

IT Cooling

**Fuel cell** electrodes

**Fuel cells**

Soot

(**fuel cell** stack with cooling fins and use of  
 expanded graphite in **fuel cells**)

- IT Epoxy resins, uses  
Fluoropolymers, uses  
Furan resins  
Phenolic resins, uses  
(**fuel cell** stack with cooling fins and use of expanded graphite in **fuel cells**)
- IT 7782-42-5, graphite, uses  
(**fuel cell** stack with cooling fins and use of expanded graphite in **fuel cells**)
- IT 9002-84-0, Ptfе  
(**fuel cell** stack with cooling fins and use of expanded graphite in **fuel cells**)
- L90 ANSWER 4 OF 13 HCA COPYRIGHT 2002 ACS no  
133:46188 Solid electrolyte **fuel cell** modules.  
Takeuchi, Shinji; Nishimura, Masayoshi; Nagata, Masakatsu;  
Mochizuki, Masataka; Iwasawa, Isamu (Kansai Electric Power Co.,  
Japan; Fujikura Ltd.). Jpn. Kokai Tokkyo Koho JP 2000182642 A2  
20000630, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP  
1998-356725 19981215.
- AB The **fuel cell** modules have a power generating chamber contg. several **fuel cell** assemblies, **fuel** gas supplying and discharging chambers above the power generating chamber, and a thermal insulator enclosing the chambers. The **fuel cell** has an electrolyte layer inside a cathode tube, an anode inside the electrolyte layer, and a fuel supplying-anode collector pipe inside the anode and are connected to each other without interconnectors to form the assembly. The cathodes of cells in an assembly are elec. connected by cathode collectors, the anodes are connected through the fuel supplying-anode collector pipes and an anode collector, and the cathode has a LaCrOx layer at the **area** contacting the **cathode** collector. The cathode may also have a Ni layer on top of the LaCrOx layer.
- IC ICM H01M008-02  
ICS H01M008-12; H01M008-24
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST solid electrolyte **fuel cell** module cathode connection
- IT **Fuel cell** cathodes  
(cathodes contg. lanthanum chromite covered surface **areas** for **interconnector**-free solid electrolyte **fuel cell** modules)
- IT Solid state **fuel cells**  
(structure of interconnector-free solid electrolyte **fuel cell** modules)
- IT 12777-94-5, Chromium lanthanum oxide  
(cathodes contg. lanthanum chromite covered surface **areas** for **interconnector**-free solid electrolyte **fuel cell** modules)
- IT 7440-02-0, Nickel, uses  
(cathodes contg. nickel and lanthanum chromite covered surface

for interconnector-free solid electrolyte **fuel cell** modules)

L90 ANSWER <sup>5</sup> OF 13 HCA COPYRIGHT 2002 ACS

130:27132 A study of a corrosion-resistant coating for a separator for a molten carbonate **fuel cell**. Hwang, E. R.; Kang, S. G. (Department of Materials Engineering, Hanyang University, Sungdong-ku, Seoul, 133-791, S. Korea). Journal of Power Sources, 76(1), 48-53 (English) 1998. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science S.A..

AB The corrosion behavior of nickel and copper coatings in the current-collector **area** of **separators** and a Ni/Al intermetallic compd. coating in the wet-seal **area** of **separators** for molten carbonate **fuel cells** is evaluated under immersion in molten carbonate salt. The corrosion-protection effect of nickel and copper coatings on 316L stainless steel is evaluated in an electrochem. half-cell by means of a potentiostatic polarization technique. In addn., the corrosion-protection behavior of a nickel-coated layer in the **anode** current-collector **area** and a Ni/Al-coated layer in the wet-seal **area** of the **separator** are studied during operation of a single cell for 10 days. Nickel suffers no observable corrosive attack for up to 500 h in the anode gas atm. (H<sub>2</sub>/CO<sub>2</sub>). By contrast, nickel and copper exhibit less corrosion resistance than 316L stainless-steel during exposure to the cathode gas atm. (CO<sub>2</sub>/O<sub>2</sub>). Under a potentiostatic anodic polarization of -1.0 V (vs. CO<sub>2</sub>/O<sub>2</sub>/Au), nickel-coated 316L stainless-steel displays a lower anodic c.d. than copper-coated and uncoated 316L stainless-steel. NiAl with a high m.p. has better corrosion resistance than other Ni/Al intermetallic compds. From single cell tests, it is found that nickel and NiAl coatings are efficient for the protection of stainless-steel in the **anode area** and wet-seal area, resp.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 55, 56

ST **fuel cell** separator corrosion resistant coating

IT Coating materials

(anticorrosive; corrosion-resistant coating for separator for molten carbonate **fuel cell**)

IT Coating materials

**Fuel cell** separators

(corrosion-resistant coating for separator for molten carbonate **fuel cell**)

IT **Fuel cells**

(molten carbonate; corrosion-resistant coating for separator for molten carbonate **fuel cell**)

IT 554-13-2, Lithium carbonate 584-08-7, Potassium carbonate 11134-23-9 12003-78-0, AlNi

(corrosion-resistant coating for separator for molten carbonate **fuel cell**)

IT 7440-02-0, Nickel, uses 7440-50-8, Copper, uses

(corrosion-resistant coating for separator for molten carbonate



## fuel cell)

- L90 ANSWER 6 OF 13 HCA COPYRIGHT 2002 ACS *u*  
 129:233122 Molten carbonate **fuel cells**. Shoji,  
 Chieko; Masuda, Yuji; Matsuo, Takahiro; Suzuki, Akira  
 (Ishikawajima-Harima Heavy Industries Co., Ltd., Japan). Jpn. Kokai  
 Tokkyo Koho JP 10255826 A2 19980925 Heisei, 5 pp. (Japanese).  
 CODEN: JKXXAF. APPLICATION: JP 1997-74685 19970312.
- AB The **fuel cells** have a molten carbonate  
 electrolyte impregnated electrolyte plate held between a cathode and  
 an anode, **separators** having reaction gas passages on the  
 backside of the **electrodes**, and wet seals between the  
**separators** and the electrolyte plate at their edges; where  
 the wet seal **areas** on the **separators** have  
 grooves of predetd. **size** filled with an electrolyte  
 retaining material to adjust the electrolyte impregnation  
**ratio** in the seal areas on the electrolyte plate.
- IC ICM H01M008-02  
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 ST molten carbonate **fuel cell** wet seal  
 IT **Fuel cells**  
 (molten carbonate; structure of wet seals contg. electrolyte  
 materials for molten carbonate **fuel cells**)
- IT Seals (parts)  
 (structure of wet seals contg. electrolyte materials for molten  
 carbonate **fuel cells**) *relevant but ribs*
- L90 ANSWER 7 OF 13 HCA COPYRIGHT 2002 ACS  
 126:214451 Separators for solid electrolyte **fuel cells**  
 . Fujimoto, Kenji; Tsunoda, Atsushi; Yoshida, Toshihiko (Tonen  
 Corp, Japan; Petroleum Energy Center Found). Jpn. Kokai Tokkyo Koho  
 JP 09045344 A2 19970214 Heisei, 4 pp. (Japanese). CODEN: JKXXAF.  
 APPLICATION: JP 1995-197488 19950802.
- AB The separators have reaction gas passage grooves at least on 1 side  
 and have 20-50% of the surface on its electrode contacting side in  
 direct contact with the electrode. **Fuel cells**  
 using these separators have high output voltage.
- IC ICM H01M008-02  
 ICS H01M008-02  
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 ST solid electrolyte **fuel cell** separator  
 IT **Fuel cell separators**  
 (**separators** with controlled direct **electrode**  
 contacting **area ratio** for solid electrolyte  
**fuel cells**)
- L90 ANSWER 8 OF 13 HCA COPYRIGHT 2002 ACS *u*  
 124:92578 Structure of high power density **fuel c ll**  
 stacks. Hasegawa, Yasuaki; Watanabe, Shogo; Yamane, Hajime; Kiriki,  
 Yoshihiro (Mazda Motor, Japan). Jpn. Kokai Tokkyo Koho JP 07272731  
 A2 19951020 Heisei, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION:  
 JP 1994-57963 19940329.

- AB The **fuel cell** stacks have unit cells comprising an electrolyte layer held between a pair of catalyst layer and a pair of separators holding the electrolyte-catalyst assembly; where the separator has an amorphous C or gas non-permeable metal layer covered with high d. graphite layers on both sides. The **areas** of the **separators** in direct contact with the catalyst layer are composed of porous C. In another structure, the electrolyte layer is held between a pair of catalytic electrodes, the stack has internal reaction passages extending in the stack direction, and the **separator** has recessed **areas** connecting the passages and the **electrode** contacting **area** and has supporting rings of a porous material or having radial openings in the recessed areas.
- IC ICM H01M008-02  
ICS H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **fuel cell** stack structure
- IT **Fuel cells**  
(structure of high power d. **fuel cell** stacks)
- IT **Fuel cells**  
(separators, structure of multilayer separators for high power d. **fuel cell** stacks)
- IT 7440-03-1, Niobium, uses 7440-44-0, Carbon, uses  
(separators contg. amorphous carbon core layers for high power d. **fuel cell** stacks)
- IT 7782-42-5, Graphite, uses  
(separators contg. high d. graphite surface layers for high power d. **fuel cell** stacks)
- L90 ANSWER (9) OF 13 HCA COPYRIGHT 2002 ACS
- 113:100815 Development of MCFC (Molten Carbonate **Fuel Cell**) with large **area electrode**. Zaima, Nobuyuki; Kakihara, Toshiaki; Morita, Tetsuyuki; Matsuyama, Toshiya; Suzuki, Akira (Fuel Cell Dev. Dep., Japan). IHI Eng. Rev., 23(2), 37-43 (English) 1990. CODEN: IHERA6. ISSN: 0018-9820.
- AB A 9-cell MCFC stack with 1 m<sup>2</sup> **electrode area** has a power output of 9.5 kW. In the fabrication of the MCFC, large **area separators** of thin metal sheet were developed and sintering conditions were established for the material of the large **area electrodes**. Stable power output was achieved by providing for uniform temp. distribution in the direction vertical to the fuel flow. The structure of the MCFC, manuf. of large-**area electrodes** (sintered Ni-8% Cr alloy powder and a cathode of porous sintered Ni powder), manuf. of large-area LiAlO<sub>2</sub> electrolyte plate, development of large-**area separator**, performance of the 10-kW cell stack, and reaction distribution in the cell are discussed.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST Section cross-reference(s): 72
- ST molten carbonate **fuel cell** development
- IT **Fuel cells**  
(molten carbonate, development of)

- IT Cathodes  
(**fuel-cell**, nickel, tape casting and sintering of large area, for molten carbonate **fuel cells**)
- IT Anodes  
(**fuel-cell**, nickel-chromium, tape casting and sintering of large area, for molten carbonate **fuel cells**)
- IT 12756-83-1  
(anodes, tape casting and sintering of large-area, for molten carbonate **fuel cells**)
- IT 7440-02-0, Nickel, uses and miscellaneous  
(cathodes, tape casting and sintering of large area, for molten carbonate **fuel cells**)
- IT 12003-67-7, Aluminum lithium oxide ( $\text{AlLiO}_2$ )  
(electrolyte, large area plate of, tape casting of, for molten carbonate **fuel cells**)
- L90 ANSWER (10) OF 13 HCA COPYRIGHT 2002 ACS ND  
107:137750 Electrolyte-supplying structure for **fuel cells**. Kodama, Yoshiaki; Soma, Akio; Komatsu, Yasutaka; Azami, Hirotaka (Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 62165866 A2 19870722 Showa, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1986-6425 19860117.
- AB **Fuel cells** have unit cells each held between an upper and a lower separator, and the upper separators have electrolyte reservoirs and electrolyte passages connecting the reservoirs and electrolyte matrixes of the cells through the ribs of the **separators** and the **areas** of **electrodes** contacting the ribs. The reservoirs are formed on the upper separators on the side opposite to the electrode-contacting side, and the passages are arranged so as to achieve a uniform temp. distribution in the cells.
- IC ICM H01M008-02  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
ST **fuel cell** electrolyte supply separator  
IT **Fuel cells**  
(separators, with electrolyte reservoirs and electrolyte passages)
- L90 ANSWER (11) OF 13 HCA COPYRIGHT 2002 ACS ND  
106:199281 (**Fuel cells**). Kuwabara, Takeshi; Kondo, Yoshimasa; Sakai, Katsunori; Akimoto, Koji (Toshiba Corp., Japan). Jpn. Kokai Tokkyo Koho JP 62055872 A2 19870311 Showa, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1985-193478 19850902.
- AB Unit **fuel cells** have catalyst layers loaded on the electrolyte-facing sides of porous C **anode** plates, hydrophilic linear **areas** and catalyst layers loaded on the electrolyte-facing sides of hydrophobic porous C **cathode** plates, and are stacked alternately with **separators** to form **fuel-cell** stacks. Each separator has a 1st ribbed porous C plate as fuel gas passage with >40% of the pores

filled with electrolyte, a 2nd ribbed porous C plate as oxidant gas passage, and a gas-nonpermeable C plate in between. The grooves on the 1st C plate are perpendicular to the linear areas on the anode plates. Phenolic resin-bonded carbon-fiber sheets were graphitized, coated on 1 side with a C-7% Pt black suspension contg. 8% PTFE to form a catalyst layer, the opposite sides were masked with plastic film patterns and coated with a 20% PTFE suspension to form anode plates. H3PO4 **fuel-cell** stacks having this structure had high gas utilization **ratios** at high gas-flow rates and longer lifetime than control stacks.

IC ICM H01M008-02  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
ST **fuel cell** phosphoric acid  
IT **Fuel cells**  
(phosphoric-acid, electrolyte storage and distribution in high performance and long lifetime)

L90 ANSWER 12 OF 13 HCA COPYRIGHT 2002 ACS ND  
100:88769 **Fuel cell**. (Kansai Electric Power Co.,  
Ltd., Japan; Fuji Electric Co., Ltd.). Jpn. Kokai Tokkyo Koho JP  
58164155 A2 19830929 Showa, 4 pp. (Japanese). CODEN: JKXXAF.  
APPLICATION: JP 1982-47994 19820325.

AB A safe **fuel cell** is prepd. by sealing  
**electrode end areas** on **separator** side,  
.gtoreq.1 matrix circumference on electrode side, and side surfaces  
of electrodes and matrix with a corrosion-resistant sealant (PTFE  
[9002-84-0]).

IC H01M008-02; H01M008-24  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
ST **fuel cell** safety; PTFE sealant **fuel**  
**cell**  
IT Sealing compositions  
(PTFE, for **fuel cells**)  
IT Safety  
(of **fuel cells**)  
IT **Fuel cells**  
(safe)  
IT 9002-84-0  
(sealant, **fuel-cell**)

L90 ANSWER 13 OF 13 HCA COPYRIGHT 2002 ACS ND  
76:20572 Mechanism of the removal of reaction water in a **fuel**  
**cell** with a quasisolid electrolyte and hydrophobized  
electrodes. Filippovich, B. S.; Kal'var'skaya, T. M. (Gos. Inst.  
Prikl. Khim., Leningrad, USSR). Elektrokhimiya, 7(10), 1505-8  
(Russian) 1971. CODEN: ELKKAX.

AB The **relative** contribution of several H2O transfer  
mechanisms in the electrode (evapn. under temp. gradient, mol.  
diffusion assocd. with the meniscus curvature on the water repellent  
electrode-electrolyte boundary, and pressing of the liq. phase  
through the electrode) to the total flow is considered. An  
**electrode** structure is assumed which contains pores of

various **diams.**, **interconnected** by capillaries of  
 a const. hydraulic **diam.**  
 CC 77 (Electrochemistry)  
 IT **Fuel cells**  
 (removal of reaction water in)  
 IT 7732-18-5  
 (removal of, in **fuel cells**)

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 DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

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L91 ANSWER <sup>1</sup> OF 9 WPIX (C) 2002 THOMSON DERWENT  
 AN 2002-538669 [57] WPIX  
 DNN N2002-426647 DNC C2002-152724  
 TI **Fuel cell** as energy source for, e.g. cellular  
 telephones, comprises membranes arranged in series, electrodes  
 connected with the membranes, and interconnects provided between two  
 adjacent electrodes.  
 DC L03 P42 T01 W01 X16  
 IN CLARA, F; NARAYANAN, S R; VALDEZ, T I  
 PA (CLAR-I) CLARA F; (NARA-I) NARAYANAN S R; (VALD-I) VALDEZ T I;  
 (CALY) CALIFORNIA INST OF TECHNOLOGY  
 CYC 99  
 PI WO 2002058179 A1 20020725 (200257)\* EN 13p H01M008-02  
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC  
 MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW  
 W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ  
 DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP  
 KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ  
 NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA  
 UG US UZ VN YU ZA ZM ZW  
 US 2002102449 A1 20020801 (200258) H01M008-10  
 ADT WO 2002058179 A1 WO 2001-US44424 20011127; US 2002102449 A1  
 Provisional US 2000-253423P 20001127, US 2001-994907 20011126  
 PRAI US 2001-994907 20011126; US 2000-253423P 20001127  
 IC ICM H01M008-02; H01M008-10  
 ICS B05D005-12; H01M008-24  
 AB WO 200258179 A UPAB: 20020906  
 NOVELTY - A **fuel cell** comprises membranes (110,  
 112, 200, 210) arranged in series so that current flows across the  
 membranes, **electrod s** connected with the membranes and  
**interconnects** (118, 122, 202, 212) provided between two  
 adjacent **electrodes**. Each **interconnect** is at

INSTANT APP

least 20% of an **area** of the **electrode(s)**.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for a method for forming a **fuel cell** comprising forming membranes which are parallel with one another, coating the membranes with catalyst layer coating, forming interconnects of paste between electrodes connected with the membranes and hot pressing the electrodes to form a membrane electrode assembly.

USE - As energy source for, e.g. cellular telephones, laptop computers or other portable electronic devices.

ADVANTAGE - The inventive **fuel cell** is formed by flat pack design which may operate without biplates. It is compact and lightweight and has higher internal resistance than that of the bipolar cell. These higher internal resistance increases power density and efficiency.

DESCRIPTION OF DRAWING(S) - The figures illustrate a first and a second interconnect technique, respectively.

Membranes 110, 112, 200, 210

Interconnects 118, 122, 202, 212

Dwg.1, 2/2

TECH WO 200258179 A1UPTX: 20020906

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred

Component: The **fuel cell** includes a methanol feed part which feed methanol to the membranes. The methanol feed part is a wicking part that feed the methanol to edges of the membranes. The membranes are formed of a planar structure. The **interconnects** are also formed of planar structures of the same **size** as the membranes.

Preferred Dimension: A **ratio** of the **area** of the **interconnect**/the **area** of the **electrode** is at least 0.2, preferably 0.2.

Preferred Method: The **interconnect** paste is applied using a hypodermic syringe.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Component: The paste includes graphite and a heat curing binder that is heated during the hot pressing.

FS CPI EPI GMPI

FA AB; GI

MC CPI: L03-E04

EPI: T01-L01; T01-M06A1; W01-C01D3C; W01-C01E5B; X16-C01; X16-E06A; X16-F03A

L91 ANSWER 2 OF 9 WPIX (C) 2002 THOMSON DERWENT

AN 2001-496825 [54] WPIX

DNN N2001-368141 DNC C2001-149227

TI **Fuel cell** stack, e.g. for vehicle, includes **fuels cells** with active area and circumference **ratio** extending to the corresponding **ratio** of a square active area.

DC L03 Q14 X16 X21

IN KOSCHANY, P

PA (MANH-N) MANHATTAN SCIENTIFICS INC

*viewed* *no*

CYC 94

PI WO 2001054218 A2 20010726 (200154)\* EN 16p H01M008-02  
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC  
 MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW  
 W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE  
 DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG  
 KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ  
 PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN  
 YU ZA ZW

AU 2001025169 A 20010731 (200171) H01M008-02

ADT WO 2001054218 A2 WO 2001-EP438 20010116; AU 2001025169 A AU  
 2001-25169 20010116

FDT AU 2001025169 A Based on WO 200154218

PRAI US 2000-176819P 20000119

IC ICM H01M008-02

ICS B60L011-18; H01M008-04; H01M008-24

AB WO 200154218 A UPAB: 20010924

NOVELTY - A **fuel cell** stack is provided with **fuels cells** having an active area and a circumference **ratio** extending to the corresponding **ratio** of a square active area. The circumference and the active area is defined by the geometrical shape of the active area. Cooling layers project beyond the circumferential outer periphery of a laminate to form inner active section and peripheral cooling fin areas.

DETAILED DESCRIPTION - A **fuel cell** stack comprises **fuel cells** electrically connected in series and having equivalent active section areas (15) and circumferences; end and separator plates delimiting each cell; and cooling layers (9), each projecting beyond the circumferential outer periphery of the laminate of the other layers to form an inner active section area and a peripheral cooling fin (11) area. The **fuel cell** comprises a laminate of layers of electrolyte membrane and catalyst, and electrode and gas diffusion layers having functions that can be combined with multifunction layers. The function of the cooling layers may also be combined with other multifunction layers. The **ratio** of circumference (14) and active area of the stack, which is defined by the geometrical shape of the active area, extends the corresponding **ratio** of a square active area.

An INDEPENDENT CLAIM is also included for the use of expanded graphite material for a bipolar plate, an electrode, and a gas diffusion layer of a **fuel cell**.

USE - For use as a **fuel cell** stack for vehicle.

ADVANTAGE - The stack has improved **ratio** of heat dissipation ability to the heat generation in the active area while using thin and lightweight and limitedly large heat conducting layers. The cooling system is inexpensive, lightweight, compact, and conducts all the waste heat of the reaction process out of the **fuel cell** stack.

DESCRIPTION OF DRAWING(S) - The figure shows a diagrammatic

plan view of the cooling fin with gas channels.

Cooling layers 9

Cooling fin 11

Circumference 14

Active section areas 15

Length 16

Dwg.2/3

TECH WO 200154218 A2UPTX: 20010924

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Device:

The cooling layers, in combination, are the **anodic** and/or

**cathodic electrodes** or gas diffusion layers, and

the **separator** plates. They have a channel structure

provided with gas channels within the active section **area**.

The active section **area** is rectangular in shape, and has a

length (16) exceeding the width by a factor of at least 1.5

(preferably 2.5-3.5). The material of the cooling layers has a

larger specific heat conductivity parallel to the plane of each of

**fuel cell** than orthogonal to that plane. The

device further comprises a blower for generating an enforced airflow

traversing over the cooling fin areas. The airflow is supported by

the dynamic and/or static pressure of the ambient air with respect

to a moving vehicle.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Component: The material of the cooling layers is a foil made of expanded graphite. It has a metal core that is covered by a carbon-polymer layer. The graphite contains distributed soot.

FS CPI EPI GMPI

FA AB; GI

MC CPI: L03-E04

EPI: X16-C01C; X16-C09; X16-E06A; X16-K; X21-A01F; X21-B01A

L91 ANSWER (3) OF 9 WPIX (C) 2002 THOMSON DERWENT

AN 1999-467822 [39] WPIX

CR 1997-272353 [24]; 1999-394190 [32]

DNN N1999-349252 DNC C1999-137074

TI Electrochemical cell has electrolyte dispersed in the pores of a porous fibrous membrane separator.

DC E36 E37 J03 L03 X16

IN ESHRAGHI, R R

PA (ESHR-I) ESHRAGHI R R

CYC 1

PI US 5928808 A 19990727 (199939)\* 15p H01M008-24

ADT US 5928808 A CIP of US 1995-549976 19951030, US 1997-869449 19970605

PRAI US 1997-869449 19970605; US 1995-549976 19951030

IC ICM H01M008-24

ICS H01M002-18; H01M010-12

AB US 5928808 A UPAB: 20000522

NOVELTY - An electrolyte is dispersed in the pores of a porous, fibrous membrane separator. Electroconductive fibres are contacted or covered with an electrocatalyst to form electrodes. At least one feed inlet and outlet is provided to and from the electrodes.



DETAILED DESCRIPTION - The electrodes comprise (I) an inner electrode (a) formed from electroconductive fibres contacted or covered with an electrocatalyst and housed in the bore of the membrane separator in which the housing has a lumen allowing free passage of liquid or gaseous feed components, or (b) formed by coating or impregnating an electrocatalyst on the shell side of a second inner hollow porous separator and housed in the bore of the first separator in which the lumen of the inner separator allows free passage of liquid or gaseous feed components, or (c) formed from an inner hollow porous separator with distinct fibrous electrodes contacting the shell side of the inner hollow porous separator, the electrodes formed from electroconductive fibres contacted or covered with an electrocatalyst, and housed in the bore of the first separator, and (II) an outer electrode consisting of either an electrocatalyst and an electroconductive material surrounding or impregnating the shell side of the separator, or electroconductive fibres contacted or covered with an electrocatalyst surrounding the separator. An INDEPENDENT CLAIM is also included for an electrochemical module comprising multiple cells as described above, in a casing with access ports for liquid and gaseous components. The cells are bundled or wound around a mandrel. The electrodes extend outside the lumen and through a tube sheet and are connected to positive and negative terminals.

USE - As a **fuel cell** or chloroalkali cell (claimed) and batteries (primary and secondary).

ADVANTAGE - A small amount of the electrocatalyst can be impregnated, coated or extruded on a fibrous substance to form an electrode.

DESCRIPTION OF DRAWING(S) - The drawing shows the electrochemical cell.


Dwg.7/12

TECH US 5928808 A UPTX: 20001114

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - The cell outer **diameter** is 0.1-1 mm. The **electrodes** are cylindrical, composed of one or more fibres and have a **diameter** of 0.1 mm-10 mm. The **separator** is a microfiltration, ultrafiltration, reverse osmosis membrane of ceramic, glass or polymer, or alternatively is a semipermeable or ion-exchange membrane coated with a perm-selective or ion exchange polymer, or is made of an electroconductive material. The **separator** surrounding the inner **electrode** is thin **compared** to the cell outer **diameter**. The **electrodes** may be fabricated entirely from the electrocatalyst material, or the electrocatalyst material together with a bonding agent and electroconductive material is impregnated, coated or extruded onto the outside wall or inside the bore of the separator. Preferred Module: Terminals are formed by wrapping a conductive strip around the cell bundle. The potting material is a thermosetting polymer or ceramic.

KW [1] 270-0-0-0 CL PRD; 97153-0-0-0 CL PRD; 2-0-0-0 CL PRD  
FS CPI EPI  
FA AB; GI; DCN

MC CPI: E11-N; E31-A02; E31-B03B; E33-A01; J03-B02; J03-B04; L03-E02;  
L03-E03; L03-E04  
EPI: X16-B01B; X16-C; X16-F02  
DRN 1514-P; 1514-U; 1532-P; 1532-U; 1781-P; 1781-U  
CMC UPB 20000522  
M3 \*01\* C017 C100 C810 M411 M424 M720 M740 M904 M905 M910 N104 N120  
Q454  
DCN: R01781-K; R01781-P  
M3 \*02\* C101 C550 C810 M411 M424 M720 M740 M904 M905 N104 N120 Q454  
DCN: R01532-K; R01532-P  
M3 \*03\* A111 A940 C101 C108 C550 C730 C801 C802 C804 C805 C807 M411  
M424 M720 M740 M904 M905 M910 N104 N120 Q454  
DCN: R01514-K; R01514-P

L91 ANSWER 4 OF 9 WPIX (C) 2002 THOMSON DERWENT   
AN 1999-429973 [36] WPIX  
CR 2001-556747 [57]  
DNN N1999-320133 DNC C1999-126651  
TI Electrolyte composition with improved wetting properties for  
electrochemical systems.  
DC E19 L03 X16  
IN LAMANNA, W M; LOCH, R B  
PA (MINN) MINNESOTA MINING & MFG CO  
CYC 81  
PI WO 9930381 A1 19990617 (199936)\* EN 37p H01M010-40  
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC  
MW NL OA PT SD SE SZ UG ZW  
W: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI  
GB GE GH GM GW HU ID IL IS JP KE KG KP KR KZ LC LK LR LS LT  
LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL  
TJ TM TR TT UA UG UZ VN YU ZW  
AU 9879548 A 19990628 (199946) H01M010-40  
EP 1044478 A1 20001018 (200053) EN H01M010-40  
R: DE FR GB IT  
KR 2001032916 A 20010425 (200164) H01M010-40  
JP 2001526451 W 20011218 (200203) 42p H01M010-40  
ADT WO 9930381 A1 WO 1998-US11708 19980605; AU 9879548 A AU 1998-79548  
19980605; EP 1044478 A1 EP 1998-930078 19980605, WO 1998-US11708  
19980605; KR 2001032916 A KR 2000-706259 20000609; JP 2001526451 W  
WO 1998-US11708 19980605, JP 2000-524835 19980605  
FDT AU 9879548 A Based on WO 9930381; EP 1044478 A1 Based on WO 9930381;  
JP 2001526451 W Based on WO 9930381  
PRAI US 1997-988507 19971210  
IC ICM H01M010-40  
ICS C07C311-48  
AB WO 9930381 A UPAB: 20011105  
NOVELTY - Wetting of battery electrodes and separators is improved  
without adversely affecting cell performance by adding a  
bis(perfluoro-alkylsulfonyl)imide surfactant salt to a conductive  
salt in the electrolyte composition.  
DETAILED DESCRIPTION - An electrolyte composition comprises:  
(a) a conductive salt; and

(b) a surfactant salt of formula  $((RfSO_2)(Rf'SO_2)N-)nM^{+n}$  (I);  
 $M^{+n}$  = cation;  
 $n = 1 - 4$ ;

$Rf, Rf' = 1 - 8$  C perfluoroalkyl ( $Rf = 1 - 12$  C), a perfluorocycloalkyl or a perfluorocycloalkyl perfluoroalkyl with 4 - 7 C ring and 1 - 4 C alkyl chain, optionally containing catenary hetero atoms, with  $Rf$  and  $Rf'$  having at least 5 C atoms;  
 in a molar **ratio** (a)/(b) = (99.9:0.1) - (75:25).

An INDEPENDENT CLAIM is also included for an electrochemical system comprising the above composition with at least one positive and one negative electrode.

USE - In manufacture of electrochemical systems such as primary and secondary batteries, double-layer capacitors, supercapacitors, **fuel cells** and electroplating and electro-refining systems.

ADVANTAGE - Surface tension of electrolytes is reduced and wetting of **electrodes** and **separators** is improved while conductivity, stability and compatibility with other cell components is maintained or enhanced. Contact **area** between electrolyte and electroactive materials is increased and range of electrolyte compositions by allowing use of high-viscosity, high surface energy solvents.

Dwg.0/3

TECH WO 9930381 A1 UPTX: 19990908

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Components: (a) and (b) are different; in (a)  $M^{+n}$  is a cation of an alkali, alkaline earth, transition, rare earth, group IIB or group IIIB metal or a tetraalkylammonium, preferably  $Na^{+}$ ,  $Ca^{2+}$ ,  $Ba^{2+}$ ,  $Al^{3+}$ ,  $Eu^{3+}$ ,  $Sm^{3+}$ ,  $(C_2H_5)_4N^{+}$  and  $(CH_3)_4N^{+}$ , especially  $Li^{+}$ ; (a) is especially  $(C_8F_{17}SO_2)N-(SO_2CF_3)Li^{+}$ ,  $(C_4F_9SO_2)_2N-Li^{+}$ ,  $(C_8F_{17}SO_2)_2N-Li^{+}$ ,  $(C_8F_{17}SO_2)N-(SO_2C_4F_9)Li^{+}$ , or  $(C_4F_9SO_2)N-(SO_2CF_3)Li^{+}$ ;  
 in (a) the anion is  $NO_3^{-}$ ,  $Br^{-}$ ,  $I^{-}$ ,  $BF_4^{-}$ ,  $PF_6^{-}$ ,  $AsF_6^{-}$ ,  $ClO_4^{-}$ ,  $SbF_6^{-}$ .  
 (b) is lithium hexafluorophosphate, lithium bis(trifluoromethanesulfonyl)imide, lithium tetrafluoroborate, lithium perchlorate, lithium hexafluoroarsenate, lithium trifluoromethylsulfonate, lithium tris(trifluoromethanesulfonyl)methide, or their mixture.

$Rf$  is 4 - 12 C and  $Rf'$  is 1 - 8 C perfluoroalkyl.  $Rf + Rf'$  is at least 8 C and preferably  $Rf'$  is at least 8 C.

Preferred Composition: Molar **ratio** of (a)/(b) is 99:1 - 90:10. Matrix material is selected such that concentration of (a) in the electrolyte is 0.5 - 1.5 moles/L and that of (b) is 10 - 100 mM/L.

Preferred Anion: In (a) is  $Rf_0SO_3^{-}$  in which  $Rf_0$  is a 1 - 12 C perfluoroalkyl,  $(Rf_1SO_2)Rf_2SO_2N^{-}$ ,  $Rf_4Rf_5N(CH_2)_nSO_2X$ ,  $Rf_6Rf_7N(CF_2)_nSO_2X$ , a bisfluoroarylsulfonyl methide  $Rf_1IISO_2C-RSO_2Rf_{III}$ , tri(perfluoroalkylsulfonyl) methide  $C(Rf_1IISO_2)(SO_2Rf_{III})(SO_2Rf_{IV})$  or of formula (II):

$Rf_1, Rf_2 = 1 - 12$  C perfluoroalkyl;

$Rf_3 = 2 - 4$  C perfluoroalkylene optionally substituted with 1 - 2 C perfluoroalkyl totaling not more than 4 C;

$X = -O^{-}$ ,  $-N-SO_2Rf_4$ ,  $C-(Rf_6SO_2)(Rf_7SO_2)$ ;

$Z = -CF_2-, -O-, -NRf_8-, -SF_4-,$   
 $Rf_4, Rf_5 = -CmF_{2m+1}, -(CF_2)_4SO_2X', Rf_1Rf_2N(CF_2)_n-, Rf_6Rf_7N(CF_2)_n-;$   
 $Rf_6, Rf_7 = -CF_2r-$   
 $Rf_8 = -CmF_{2m+1}, -(CF_2)_qSO_2X',$   
 $n = 1 - 4;$   
 $m = 1 - 12;$   
 $q = 1 - 4;$   
 $Rf_{II}, Rf_{III}, Rf_{IV} = 1 - 12 \text{ C perfluoroalkyl};$   
 $X' = H, Br, Cl, I, 1 - 20 \text{ C aryl or alkaryl}.$   
 Preferred Product: The is a (rechargeable) battery preferably comprising a lithium intercalated carbon anode and a metal oxide cathode.

ABEX WO 9930381 A1 UPTX: 19990908

EXAMPLE - Wetting ability of 3 fluorinated imide surfactant salts, namely  $(C_8F_{17}SO_2)N-(SO_2CF_3)Li^+$  (I),  $(C_4F_9SO_2)N-(SO_2C_4F_9)Li^+$  (II) and  $(C_4F_9SO_2)N-(SO_2CF_3)Li^+$  (III), was assessed by dissolving each salt at 1 molar concentration in a 50/50 propylene carbonate/ethylene carbonate blend, then applying the liquid electrolyte so formed to a polyethylene and a polypropylene separator surface. Contact angles, measured initially and after 500 seconds, were as follows: 47, 0 (I); 47, 0 (II) and 41, 0 respectively for polyethylene and 47, 39 (I); 59, 56 (II) and 76, 69 (III). This compared to respective figures of 67, 65 (polyethylene) and 76, 76 (polypropylene) for an imide salt with only 4 carbon atoms its combined perfluorinated chain  $((C_2F_5SO_2)N-(SO_2C_2F_3)Li^+)$ .

KW [1] 218219-0-0-0 CL; 218220-0-0-0 CL; 218222-0-0-0 CL; 218223-0-0-0 CL; 0004-26301 CL; 2963-0-0-0 CL; 1025-0-0-0 CL; 131080-0-0-0 CL; 218218-0-0-0 CL; 166-0-0-0 CL; 131494-0-0-0 CL; 2989-0-0-0 CL; 218227-0-0-0 CL; 218229-0-0-0 CL; 12158-0-0-0 CL; 218231-0-0-0 CL; 218232-0-0-0 CL; 176476-0-0-0 CL; 218233-0-0-0 CL; 218234-0-0-0 CL; 218236-0-0-0 CL

FS CPI EPI

FA AB; GI; DCN

MC CPI: E05-A; E05-B; E05-B03; E05-L; E05-M; E05-N; E05-P; E10-A08C; E10-A09B8; E31-E; E31-K07; E31-L; E31-Q02; L03-B03; L03-E01C; L03-E04

EPI: X16-B01F

DRN 1821-U; 1826-U

CMC UPB 20011031

M3	*01*	A103	A960	C316	C710	H6	H601	H607	H609	H684	H685	H689	K0
		K3	K352	K399	M280	M315	M322	M332	M344	M362	M392	M411	M510
		M520	M530	M540	M620	M630	M782	M904	M905	Q454	Q616	R023	
		DCN: RA0DGS-K; RA0DGS-M											
M3	*02*	A103	A960	C316	C710	H6	H601	H607	H609	H684	H685	H689	K0
		K3	K352	K399	M280	M314	M322	M332	M344	M362	M392	M411	M510
		M520	M530	M540	M620	M630	M782	M904	M905	Q454	Q616	R023	
		DCN: RA0DGT-K; RA0DGT-M											
M3	*03*	A103	A960	C316	C710	H6	H601	H607	H609	H684	H685	H689	K0
		K3	K352	K399	M280	M311	M315	M321	M332	M344	M362	M392	M411
		M510	M520	M530	M540	M620	M630	M782	M904	M905	Q454	Q616	R023
		DCN: RA0DGT-K; RA0DGT-M											
M3	*04*	A103	A960	C316	C710	H6	H601	H607	H609	H684	H685	H689	K0

		K3	K352	K399	M280	M314	M315	M321	M332	M344	M362	M392	M411
		M510	M520	M530	M540	M620	M630	M782	M904	M905	Q454	Q616	R023
		DCN: RA0DGV-K; RA0DGV-M											
M3	*05*	A103	A960	C316	C710	H6	H601	H607	H609	H684	H685	H689	K0
		K3	K352	K399	M280	M311	M314	M321	M332	M344	M362	M392	M411
		M510	M520	M530	M540	M620	M630	M782	M904	M905	Q454	Q616	R023
		DCN: RA0DGV-K; RA0DGV-M											
M3	*06*	A100	A103	A111	A200	A220	A256	A313	A400	A500	A600	A700	A762
		A763	A960	C316	C710	C800	C801	C802	C803	C804	C805	C806	C807
		G003	G050	G553	G563	H181	H601	H607	H608	H609	H663	H681	H682
		H683	H684	H685	H689	K352	K399	L722	M126	M148	M210	M211	M212
		M213	M214	M215	M216	M220	M221	M222	M223	M224	M225	M226	M231
		M232	M233	M273	M280	M283	M311	M312	M313	M314	M315	M316	M320
		M321	M322	M331	M332	M333	M334	M340	M344	M352	M362	M391	M392
		M411	M415	M416	M510	M520	M530	M540	M541	M542	M620	M630	M650
		M782	M904	M905	Q454	Q616	R023						
		DCN: 0004-26301-K; 0004-26301-M											
M3	*07*	A103	A940	C108	C307	C510	C730	C801	C802	C803	C804	C807	M411
		M782	M904	M905	M910	Q454	R023						
		DCN: R01821-K; R01821-M											
M3	*08*	A103	A940	B105	B720	B752	B809	B831	C009	C100	C803	C804	C805
		C806	C807	H607	M411	M782	M904	M905	Q454	R023			
		DCN: RA03PB-K; RA03PB-M											
M3	*09*	A103	A940	B133	B720	B752	B829	B831	C009	C100	C803	C804	C805
		C806	C807	M411	M782	M904	M905	Q454	R023				
		DCN: R07963-K; R07963-M											
M3	*10*	A103	A940	C017	C108	C300	C730	C801	C803	C804	C805	C807	M411
		M782	M904	M905	M910	Q454	R023						
		DCN: R01826-K; R01826-M											
M3	*11*	A103	A940	B115	B720	B752	B819	B831	C009	C100	C803	C804	C805
		C806	C807	M411	M782	M904	M905	Q454	R023				
		DCN: R10929-K; R10929-M											
M3	*12*	A103	A960	C710	H6	H607	H685	K0	K4	K431	K432	M280	M311
		M321	M344	M362	M391	M411	M510	M520	M530	M540	M620	M630	M782
		M904	M905	Q454	R023								
		DCN: R07047-K; R07047-M; RA00NL-K; RA00NL-M											
M3	*13*	A103	A960	C710	H6	H601	H607	H608	H684	H685	K0	K4	K431
		K432	M280	M312	M321	M332	M344	M362	M391	M411	M510	M520	M530
		M540	M620	M630	M782	M904	M905	Q454	R023				
		DCN: RA0DGZ-K; RA0DGZ-M											
M3	*14*	A103	A960	C710	H6	H601	H607	H609	H684	H685	H689	K0	K4
		K431	K432	M280	M316	M321	M332	M344	M362	M391	M411	M510	M520
		M530	M540	M620	M630	M782	M904	M905	Q454	R023			
		DCN: RA0DH0-K; RA0DH0-M											
M3	*15*	A103	A960	C316	C710	H6	H607	H685	H689	K0	K3	K352	K399
		M280	M311	M322	M344	M362	M392	M411	M510	M520	M530	M540	M620
		M630	M782	M904	M905	Q454	R023						
		DCN: RA0AWK-K; RA0AWK-M											
M3	*16*	A111	A960	C316	C710	H6	H607	H685	H689	K0	K3	K352	K399
		M280	M311	M322	M344	M362	M392	M411	M510	M520	M530	M540	M620
		M630	M782	M904	M905	Q454	R023						
		DCN: RA0DH2-K; RA0DH2-M											


M3 \*17\* A103 A960 C316 C710 H6 H601 H607 H609 H684 H685 H689 K0  
 K3 K352 K399 M280 M312 M322 M332 M344 M362 M392 M411 M510  
 M520 M530 M540 M620 M630 M782 M904 M905 Q454 R023  
 DCN: RA0DH3-K; RA0DH3-M

M3 \*18\* A313 A960 C316 C710 H6 H607 H685 H689 K0 K3 K352 K399  
 M280 M311 M322 M344 M362 M392 M411 M510 M520 M530 M540 M620  
 M630 M782 M904 M905 Q454 R023  
 DCN: RA0DH4-K; RA0DH4-M

M3 \*19\* A103 A960 C710 H1 H103 H181 H6 H601 H607 H609 H684 H685  
 H689 K0 K4 K431 K432 M280 M311 M312 M321 M322 M332 M344  
 M362 M393 M411 M510 M520 M530 M540 M620 M630 M782 M904 M905  
 Q454 R023  
 DCN: RA0DH5-K; RA0DH5-M

M3 \*20\* A103 A910 C316 H6 H685 H689 K0 K4 K442 K499 L6 L650  
 M280 M311 M312 M321 M322 M331 M340 M343 M344 M361 M362 M391  
 M392 M411 M510 M520 M530 M540 M620 M782 M904 M905 Q454 R023  
 DCN: RA0DH7-K; RA0DH7-M

M3 \*21\* A103 A960 C316 C710 H1 H103 H182 H6 H601 H607 H609 H684  
 H685 H689 K0 K3 K352 K399 M280 M311 M312 M322 M323 M332  
 M344 M362 M393 M411 M510 M520 M530 M540 M620 M630 M782 M904  
 M905 Q454 R023  
 DCN: RA0DH8-K; RA0DH8-M

L91 ANSWER 5 OF 9 WPIX (C) 2002 THOMSON DERWENT   
 AN 1999-394190 [33] WPIX  
 CR 1997-272353 [24]; 1999-467822 [36]; 2000-095613 [02]  
 DNN N1999-294606 DNC C1999-115770  
 TI Fabricating fibrous electrochemical cell with fiber which extends  
 longer as **compared** to fiber diameter.  
 DC A85 F01 F07 L03 X16  
 IN ESHRAGHI, R R  
 PA (ESHR-I) ESHRAGHI R R  
 CYC 1  
 PI US 5916514 A 19990629 (199933)\* 15p H01M006-02  
 ADT US 5916514 A CIP of US 1995-549976 19951030, US 1997-869448 19970605  
 PRAI US 1997-869448 19970605; US 1995-549976 19951030  
 IC ICM H01M006-02  
 AB US 5916514 A UPAB: 20000215

NOVELTY - The cell is placed in contact with a current collector comprising a fibrous, electrically conductive material of about the same length and outside diameter as the inner electrode, or placing the assembly in contact with an outer electrode fiber of about the same length and diameter of the inner electrode, forming an electrochemical cell.

DETAILED DESCRIPTION - Fabrication of a fibrous electrochemical cell comprising a fiber which extends longer as **compared** to the fiber **diameter**, comprises (a) placing a membrane **separator** having a bore side, shell side and lumen which houses the inner **electrode** and allows for passage of liquid or gas through the core side, around a fibrous positive or negative inner electrode which comprises an electrically conductive fiber in contact with a positive or negative electrocatalyst or

electroactive material, forming an assembly; (b) disposing an electrolyte in the pores of the membrane separator of the assembly; (c) impregnating the shell side pores of the separator with a material or forming a thin layer of the material in contact with the separator, which material comprises a positive or negative electrocatalyst and an electrically conductive material forming an electrochemical cell; and (d) placing the cell in contact with a current collector comprising a fibrous, electrically conductive material of about the same length and outside diameter as the inner electrode, or placing the assembly in contact with an outer electrode fiber of about the same length and diameter of the inner electrode, forming an electrochemical cell. The outer electrode comprises an electrically conductive fibrous material in contact with a layer of positive or negative electrocatalyst or electroactive material.

USE - Used in making batteries, **fuel cells** or other electrochemical reaction cells.

ADVANTAGE - The high surface area available to the electrocatalyst reduces the requirement of the unused bulk quantities on the electrodes, and reduces the material and fabrication cost of the cells.

DESCRIPTION OF DRAWING(S) - Figure 2a shows the hollow fiber membrane as separator for fibrous electrode.

Hollow Fiber Membrane 1

Fibrous Electrode 4

Dwg.2A/12

TECH US 5916514 A UPTX: 19990819

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Process: The cell has an outside diameter of 100-1000 micrometer and at least 1 **electrode** comprises at least 1 fiber having an outside **diameter** of about 10-1000 micrometer. The cell has a cylindrical geometry with an outside **diameter** of 1-10 mm. The membrane **separator** is thinner than the cell outer **diameter** and is made from micro filtration, ultra filtration, reverse osmosis, ceramic, glass and polymeric membranes. The fibrous **electrodes** are entirely made from the electrocatalyst or electroactive material, or are made by impregnating, coating, or extruding the electrocatalyst or electroactive material on an electrically conductive substrate.

FS CPI EPI

FA AB; GI

MC CPI: A12-E06; F04-G; L03-E01; L03-E04

EPI: X16-A

PLE UPA 20000215

[1.1] 018; P0000; S9999 S1207 S1070

[1.2] 018; ND01; ND07; N9999 N5970-R; N9999 N6962-R; N9999 N6086; N9999 N7147 N7034 N7023; N9999 N7067 N7034 N7023; N9999 N7045 N7034 N7023; N9999 N7067 N7034 N7023; Q9999 Q7772; Q9999 Q6917; Q9999 Q8060; Q9999 Q7396 Q7330

L91 ANSWER (6) OF 9 WPIX (C) 2002 THOMSON DERWENT  
AN. 1989-300354 [41] WPIX

ND

DNN N1989-229117 DNC C1989-132857  
 TI Monolithic solid oxide **fuel cell** stack -  
 amenable to simple reactant feeding and manifolding and is free from  
 micro-cracks in its component layers.  
 DC L02 L03 P42 X16  
 IN BUSWELL, R F; MARICLE, D L  
 PA (ITFU) INT FUEL CELLS CORP  
 CYC 1  
 PI US 4857420 A 19890815 (198941)\* 8p  
 PRAI US 1987-107817 19871013  
 IC B05D005-12; H04M008-10  
 AB US 4857420 A UPAB: 19930923

A monolithic solid oxide **fuel cell** stack is  
 formed by: (a) forming electrode sub-assemblies by: (i) providing  
 appropriately sized green unsintered tapes of solid oxide  
 electrolyte material; (ii) sintering tapes to form plates of  
 electrolyte material of appropriate operational density; (iii)  
 forming a finished layer of oxide material on one surface of  
 sintered electrolyte plates; (iv) forming a finished layer of  
**cathode** on an opposite surface of sintered electrolyte  
 plates; (b) forming gas **separator**-reactant flow field  
 sub-assemblies by: (i) providing appropriately **sized**  
 green unsintered sheets of **interconnect** material; (ii)  
 sintering sheets to form laminae of **interconnect** material;  
 (iii) forming a finished **anode** flow field layer of  
**anode** material on one surface of laminae, anode flow field  
 layers including parallel ribs and intervening grooves extending  
 across laminae in a first direction; (iv) forming a finished cathode  
 flow field layer on an opposite surface of laminae, cathode flow  
 field layers including parallel ribs and intervening grooves  
 extending across laminae in a second direction perpendicular to  
 first direction; (c) stacking electrode sub-assemblies and gas  
 separator-reactant flow field sub-assemblies one atop the other in  
 alternating fashion with cathode material layers abutting anode flow  
 field layers to form a stack pre-assembly; (d) heating stack  
 preassembly to an elevated subsintering temp. to cause softening of  
 subassemblies which may be creep flattened to form an intimate  
 interfacial contact; (e) applying a light compressive load axially  
 to stack preassembly during heating to cause them to fuse together  
 into a monolithic stack structure.

USE/ADVANTAGE - A method for making an improved monolithic  
 solid oxide **fuel cell** stack which is amenable to  
 simple reactant feeding and manifolding and is **relatively**  
 free from micro-cracks in its component layers.

4/5

FS CPI EPI GMPI  
 FA AB; GI  
 MC CPI: L03-H04A  
 EPI: X16-C

L91 ANSWER 7 OF 9 WPIX (C) 2002 THOMSON DERWENT  
 AN 1988-044455 [07] WPIX

ND



DNN N1988-033661 DNC C1988-019764

TI Composite substrate for **fuel cells** - comprises two porous carbon electrodes with mutually perpendicular gas flow channels sandwiching an oversized, edge-sealed separator.

DC A85 L03 X16

IN FUKUDA, H; FUNABASHI, M; SAGI, M

PA (KURE) KUREHA KAGAKU KOGYO KK; (KURE) KUREHA CHEM IND CO LTD

CYC 7

PI GB 2193838 A 19880217 (198807)\*  
 DE 3727282 A 19880218 (198808)  
 JP 63048766 A 19880301 (198814)  
 FR 2602915 A 19880219 (198815)  
 GB 2193838 B 19891220 (198951)  
 DE 3727282 C 19910620 (199125)  
 JP 07006773 A 19950110 (199511) 5p H01M008-02

ADT GB 2193838 A GB 1987-19148 19870813; DE 3727282 A DE 1987-3727282 19870812; JP 63048766 A JP 1986-190959 19860814; FR 2602915 A FR 1987-11539 19870813; JP 07006773 A Div ex JP 1986-190959 19860814, JP 1993-238367 19860814

PRAI JP 1986-190959 19860814

IC C04B035-52; H01M002-14; H01M004-96; H01M008-02  
 ICM H01M008-02  
 ICS C04B035-52; H01M002-14; H01M004-88; H01M004-96

AB GB 2193838 A UPAB: 19930923  
**Fuel cell** substrate comprises: a separator (1) sandwiched between two porous C electrodes (2) each provided with flow channel grooves, the grooves of one electrode being perpendicular to those of the other; and peripheral sealers (3) joined to the separator via a layer of fluorocarbon resin (4). The **ratio** of the cross section of the grooves on the fuel electrode side to that of the grooves on the air electrode side is 1-2:3.  
 USE/ADVANTAGE - Esp. with **fuel cells** of the H3PO4 type. The flow channel areas **ratio** conforms to the conditions of the actual fuel used; the peripheral seal prevents leakage of reactant gas; and the structure has high resistance to H3PO4.  
 1/3

ABEQ DE 3727282 C UPAB: 19930923  
 Substrate for **fuel cell** of the phosphoric acid type consists of a separator (1), two electrode substrates (2,2'), for fuel and air electrodes, with flow channels (5,6) for gas reactants formed by the separator and electrode substrates. Electrodes substrates are porous and C-contg. and have a mean density of 0.3-0.9 g/ml, with gas permeability not less than 566 cm/s. bar. **Ratio** of total cross sectional area of flow channels for gas reactants on the fuel electrode side to the total cross sectional area of flow channels on the air electrode side is 1:3 to 2:3.  
 ADVANTAGE - Very good resistance to phosphoric acid and compact.

ABEQ GB 2193838 B UPAB: 19930923

A composite substrate for **fuel cells**, comprising  
 (1) a separator, (2) two porous and carbonaceous electrode substrates which have been respectively provided with a plurality of grooves forming flow channels of the reactant gas on one side thereof and one flat surface on the other side thereof, and have been joined to opposing surfaces of said separator so that said flow channels of the reactant gas in one of said electrode substrates are perpendicular to those in the another electrode substrate and said separator extends beyond both edges of said electrode substrate that are parallel to said flow channels of the reactant gas in said electrode substrate and (3) peripheral sealers joined to the extended peripheries of said **separator**, which extend beyond the both edges of said **electrode** substrate, via a layer of a fluorocarbon resin, a **ratio** of the sum of the cross-sectional **area** of said flow channels of the reactant gas formed by said **separator** and the grooves of said porous and carbonaceous **electrode** substrate on the fuel **electrode** side to the sum of the cross-sectional **area** of said flow channels of the reactant gas formed by said **separator** and the grooves of said porous and carbonaceous **electrode** substrate on the air **lectrode** side being from 1:3 to 2:3.

FS CPI EPI  
 FA AB  
 MC CPI: A04-E08; A12-E06C; L03-E04  
 EPI: X16-C; X16-E06  
 PLC UPA 19930924  
 KS: 0210 0231 0941 0947 1277 1282 1310 1996 2198 2200 2458 2488 2522  
 2524 2653 2654 2667 3256 3258 2682 2684 2685 2739

FG: \*001\* 014 04- 062 064 087 14& 140 153 226 23& 231 236 359 36&  
 37& 446 455 481 50& 502 540 575 58& 595 596 60- 604 608  
 609 623 627 651 688 726

L91 ANSWER 8 OF 9 WPIX (C) 2002 THOMSON DERWENT *Viewed*  
 AN 1986-292716 [45] WPIX *no*  
 DNN N1986-218669 DNC C1986-126776  
 TI Calcined carbon composite spot bonded through flexible graphite film  
 - to prevent focus of stress in bond, useful e.g. as **fuel**  
**cell** porous electrode.  
 DC A81 E36 L03 X16  
 IN KAJI, H; SAITOH, K  
 PA (KURE) KUREHA KAGAKU KOGYO KK  
 CYC 6  
 PI DE 3614574 A 19861030 (198645)\* 57p  
 GB 2175578 A 19861203 (198649)  
 FR 2581253 A 19861031 (198650)  
 JP 61251584 A 19861108 (198651)  
 JP 61253768 A 19861111 (198651)  
 US 4794043 A 19881227 (198903)  
 GB 2175578 B 19890504 (198918)  
 DE 3614574 C 19900712 (199028)

JP 02040026 B 19900910 (199040)  
 CA 1273989 A 19900911 (199042)  
 JP 04050709 B 19920817 (199237) 9p H01M004-86  
 ADT DE 3614574 A DE 1986-3614574 19860429; GB 2175578 A GB 1986-10200  
 19860425; FR 2581253 A FR 1986-6336 19860430; JP 61251584 A JP  
 1985-93494 19850430; JP 61253768 A JP 1985-93495 19850430; US  
 4794043 A US 1986-854607 19860422; JP 02040026 B JP 1985-93494  
 19850430; JP 04050709 B JP 1985-93495 19850430

FDT JP 04050709 B Based on JP 61253768

PRAI JP 1985-93494 19850430; JP 1985-93495 19850430

IC ICM H01M004-86

ICS B01J006-00; B29C065-48; B32B003-10; B32B003-14; B32B009-00;  
 C01B033-04; C04B035-52; H01M002-16; H01M004-88; H01M004-96;  
 H01M008-02; H01M008-22

AB DE 3614574 A UPAB: 19930922

Carbon prod. (I) has carbonaceous materials (II) bonded by flexible graphite films (III), which are integrated to a carbon component by calcination in an inert atmos. The areas of the bond have zone(s) bonding (II) and unbonded zone(s), which are of any shape and uniformly arranged in the area of the bond.

Pref. the zones of (III) corresp. to the unbonded zones of (II) are hollow. The fraction of the total area of the unbonded zones on the bonding area of (II) is 20-80% of the total area of this surface. In the **fuel cell** electrode substrate, the distance between adjacent protrusions is max. 10 mm. The protrusions may be quadrilateral, rectangular, round or elliptical parallel to the surface and quadrilateral, rectangular or trapezoidal perpendicular to the surface and arranged in series or alternately. The porous plates have an average density of 0.25-0.9 g/cc and gas permeability of min. 30 cm<sup>2</sup>/h.mm H<sub>2</sub>O, whilst the protrusions have an average density of 0.40-1.8 g/cc.

Calcination is carried out in an inert atmos. at min. 800 deg.C. The difference in the rate (%) of linear expansion and contraction of the 2 (II) to be bonded is not more than 3%.

USE/ADVANTAGE - (I) is claimed as an electrode component, comprising a flat porous carbonaceous plate with protrusions bonded to another (II) through (III), esp. on **electrode** substrate for **fuel cells** with one (II) as **separator**. The specified construction preventing stresses being focussed on the bonded **areas**.

1/4

ABEQ DE 3614574 C UPAB: 19930922

New carbon prod. (I) comprises carbon materials (II) between which are inserted flexible graphite films (III). (II) and (III) are bonded together, and the materials so bonded are integrated to a carbon material by calcining in an inert atmos.

The improvement is that a bonding surface of at least one of the carbon materials has: (a) bonding areas and (b) non-bonding areas, which are arranged uniformly on the bonding surface. The **ratio** of the total surface of areas (b) on the bonding surface of the carbon material, to the total surface of the bonding surface is 20-80%.

USE - (I) is useful as part of an electrode substrate.

ABEQ GB 2175578 B UPAB: 19930922

A body which comprises two parts of the same or different carbonaceous material each joined over one surface to opposing surfaces of an interposed flexible graphite sheet, in which each or either of the joining surfaces includes a uniform arrangement of joining and non-joining areas.

ABEQ US 4794043 A UPAB: 19930922

Carbon prod. comprises carbonaceous materials (I) between which are interposed flexible graphite sheets (II). (I) and (II) are joined together and the thus joined materials have been integrated by calcination, as a unitary carbon body, in an inert atmos. The joining surface of at least one of materials (I) comprises both joining parts and non-joining parts, which have an optional shape and are uniformly arranged on the joining surface. The **ratio** of the total area of the non-joining parts in the joining surface of materials (I), to the total area of the joining surface is from 0.20 to 0.80. The value of the difference of the rate (%) of linear expansion and contraction at calcination between two materials (I), to be subjected to mutual joining via (II), is not more than 3%.

Pref. (I) having non-joining parts is a plate having depressed parts.

ADVANTAGE - New prod. is free from curvature, crack and exfoliation.

FS CPI EPI

FA AB

MC CPI: A10-E05B; A12-E06A; A12-E06B; E31-N03; L02-H04

EPI: X16-C; X16-E06; X16-F02

DRN 0270-U; 0272-U; 0437-U; 1669-P; 1669-U; 5085-U; 5086-U

PLC UPA 19930924

KS: 0036 0231 1277 1282 1310 1983 1996 2007 2010 2198 2200 2213 2217  
2318 2427 2431 2434 2437 2440 2488 2491 2507 2510 2524 2541 2545  
2682 2723 2726 2729 2739

FG: \*001\* 014 04- 14& 140 153 226 23& 231 236 244 245 247 251 307  
308 309 310 316 332 359 393 398 431 437 440 443 445 446  
46& 476 477 481 60- 609 623 627 681

CMC UPB 19930924

M3 \*01\* C106 C810 M411 M720 M903 M910 N480 N515 Q411 Q454 R044

L91 ANSWER 9 OF 9 WPIX (C) 2002 THOMSON DERWENT

AN 1982-76575E [36] WPIX

CR 1983-41504K [17]; 1983-741094 [33]; 1983-758690 [36]; 1984-269035 [43]

TI Electrochemical cell stack - has integral separator spacer between pair of plastics sheet based electrodes.

DC L03 P73 X16 X22

IN BELLOWS, R J; EINSTEIN, H; GRIMES, P G; NEWBY, K R; TSIEN, E

PA (ESSO) EXXON RES & ENG CO

CYC 12

PI US 4346150 A 19820824 (198236)\* 10p

EP 66938 A 19821215 (198251) EN

R: AT CH DE FR GB IT LI SE  
 JP 57199167 A 19821207 (198303)  
 CA 1174729 A 19840918 (198442)  
 CA 1183203 A 19850226 (198513)  
 CA 1183204 A 19850226 (198513)  
 CA 1184972 A 19850402 (198518)  
 AU 8547419 A 19860220 (198615)  
 EP 203656 A 19861203 (198649) EN  
 R: AT CH DE FR GB IT LI SE  
 EP 203657 A 19861203 (198649) EN  
 R: AT CH DE FR GB IT LI SE  
 AU 8817742 A 19881006 (198848)  
 EP 66938 B 19910424 (199117)  
 R: AT CH DE FR GB IT LI SE  
 EP 203657 B 19910508 (199119)  
 R: AT CH DE FR GB IT LI SE  
 DE 3280325 G 19910529 (199123)  
 DE 3280334 G 19910613 (199125)  
 EP 203656 B 19911023 (199143)  
 R: AT CH DE FR GB IT LI SE  
 DE 3280369 G 19911128 (199149)  
 JP 05030029 B 19930507 (199321) 9p H01M012-08  
 ADT EP 66938 A EP 1982-200846 19820309; EP 203656 A EP 1982-200847  
 19820309; JP 05030029 B JP 1982-43688 19820318  
 FDT JP 05030029 B Based on JP 57199167  
 PRAI US 1981-268675 19810601; US 1981-268666 19810601; US 1981-268665  
 19810601; US 1981-268674 19810601  
 REP No-SR.Pub; CH 119558; DE 2627143; FR 1504315; FR 1547710; FR  
 2085028; FR 2146144; FR 2146602; GB 1160587; US 4218521; FR 2085029;  
 FR 2300424; 3.Jnl.Ref; A3...8710; A3...8711; DE 1810679; EP 22402;  
 FR 2138430; FR 2347787; US 4124478; US 4153759; US 4169816; FR  
 1437710  
 IC ICM H01M012-08  
 ICS B32B031-30; C25B009-00; C25B011-02; C25B013-02; H01M002-14;  
 H01M004-00; H01M008-00; H01M010-36  
 AB US 4346150 A UPAB: 19970926  
 A stack, partic. in a battery, electrolyser or **fuel**  
**cell**, has each cell (10) with an integral **separator**  
 and spacer (28) between adjacent **electrodes** (29) each  
 consisting of a plastic sheet with a coextruded electrically  
 conductive mid-portion and non-conductive side **regions**.  
 The separator-spacer and electrodes are pref. assembled by male  
 and female connections which are hollow and form fluid conduits for  
 the cells. The **separator**-spacer may have a microporous  
 central **area** (30) and non-porous border (31), and may have  
 projections on each side for spacing the **electrodes** and  
 forming fluid compartments. The **electrodes** may be bipolar  
 to operate in a zinc-bromine system.  
 Dwg.3/7  
 ABEQ EP 66938 B UPAB: 19930915  
 An electrode for use in an electrochemical cell (for example a  
 zinc-bromine cell) comprising a central part (33) of

electrically-conductive plastics material and side parts (37) of electrically non-conductive plastics material which have been coextruded with the central part (33), characterised in that the side parts (37) are provided only on two opposite edges of the central part (33) as a result of coextrusion in a side-by-side **relationship** with the central part (33), and the side parts (37) have substantially the same thickness as the central part (33) and the two edges (38) of the central part (33) extending between the side parts (37) are undercut so that the lengths of the side parts exceed the length of the undercut central part between the two said edges.

ABEQ EP 203657 B UPAB: 19930915

An electrochemical appts. comprising at least one cell (10) having a separator disposed between electrodes, each comprising a central part (33) of electrically-conductive plastics material and side parts (37) of electrically non-conductive plastics material which have been co-extruded with the central part (33), characterised in that the side parts (37) are provided only on two opposite edges of the central part (33) as a result of co-extrusion in a side-by-side **relationship** with the central part (33) and the side parts (37) have substantially the same thickness as the central part (33) and the two edges (38) of the central part (33) extending between the side parts (37) are undercut so that the lengths of the side parts exceed the length of the undercut central part between the two said edges.

ABEQ EP 203656 B UPAB: 19930915

A unitary separator and spacer unit (28) for use in an electrochemical cell having electrodes (29) and through which cell, during operation, a circulating electrolyte flows in contact with the electrodes, adjacent pairs of electrodes (29) being separated and spaced apart by a respective unit (28), the said unit comprising a single non-porous frame or border (31) surrounding and defining the edges or borders of the faces of a non-perforated microporous web (30) which is thinner than the frame or border (31) in order to define or form either internal compartments or recesses forming at least part of such internal compartments between the unit and the adjacent electrodes when assembled with the latter so that circulating electrolyte can flow about said electrodes, said web being capable of providing ionic communication between adjacent compartments of the cell, a plurality of discrete pebble-shaped and/or rod-shaped projections (32, 32a, 32b) extending from each face of the web and which projections are ionically either less conductive or substantially non-conductive for maintaining a spaced compartmental distance between said unit (28) and adjacent electrodes (29), substantially all of said projections extending from one face of the web being directly opposite corresponding projections extending from the other face thereof, the web being preferably ion-selective.

ABEQ JP 93030029 B UPAB: 19931114

A unitary separator and spacer unit is for use in an electrochemical cell having electrodes. During operation, a circulating electrolyte flows in contact with the electrodes adjacent pairs of electrodes

being separated and spaced apart by a respective unit. Unit comprises a single non-porous frame or border surrounding and defining the edges or borders of the faces of a non-perforated microporous web which is thinner than the frame or border in order to define or form either internal compartments or recesses forming at least part of such internal compartments between the unit and the adjacent electrodes when assembled with the latter so that circulating electrolyte can flow about said electrodes. Web is capable of providing ionic communication between adjacent compartments of the cell, a plurality of discrete pebble-shaped and/or rod-shaped projections extending from each face of the web and which projections are ionically either less conductive or substantially non-conductive for maintaining a spaced compartmental distance between unit and adjacent electrodes. All projections extending from one face of the web being directly opposite corresponding projections extending from the other face, the web being ion-selective. (J57199167-A)

FS CPI EPI GMPI  
 FA AB  
 MC CPI: L03-E01B; L03-E01C; L03-E04  
 EPI: X16-B01X; X16-C; X22-F

=> file japio

FILE 'JAPIO' ENTERED AT 10:15:49 ON 10 OCT 2002  
 COPYRIGHT (C) 2002 Japanese Patent Office (JPO)- JAPIO

FILE LAST UPDATED: 11 SEP 2002 <20020911/UP>  
 FILE COVERS APR 1973 TO MAY 31, 2002

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L92 ANSWER <sup>1</sup> OF 15 JAPIO COPYRIGHT 2002 JPO *already viewed*  
 ACCESSION NUMBER: 2002-151111 JAPIO  
 TITLE: SOLID POLYMER FUEL CELL  
 INVENTOR: SEKI AKIRA; TARUYA YOSHIO; DOI NORIFUMI; FUKUDA SHINJI  
 PATENT ASSIGNEE(S): SUMITOMO METAL IND LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002151111	A	20020524	Heisei	H01M008-02

#### APPLICATION INFORMATION

STN FORMAT: JP 2000-343949 20001110  
 ORIGINAL: JP2000343949 Heisei  
 PRIORITY APPLN. INFO.: JP 2000-343949 20001110  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002  
 AN 2002-151111 JAPIO

AB PROBLEM TO BE SOLVED: To provide a solid polymer **fuel cell** with high cell characteristics even if stainless steel having **relatively** large contact resistance is used as a separator material.

SOLUTION: This solid polymer **fuel cell** has an **anode** side **separator** and a **cathode** side **separator** both made of stainless steel, for constituting a unit cell, and the contact **area** of an **anode** with the **separator** and the contact **area** of a **cathode** with the **separator** are formed in a **ratio** of 0.3 to 0.7 when the **anode area** and the **cathode area** is specified as 1. A carbide base metal compound, a boride base metal compound both are conductive may be exposed to the surfaces of the **separators** made of stainless steel to reduce corrosion resistance.

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IC ICM H01M008-02  
ICS H01M008-10

L92 ANSWER 2 OF 15 JAPIO COPYRIGHT 2002 JPO

ACCESSION NUMBER: 2001-216978 JAPIO

TITLE: **FUEL CELL** AND INSULATING  
COATING REMOVING METHOD FOR METAL SEPARATOR

INVENTOR: HIGASHIYAMA KIYOSHI

PATENT ASSIGNEE(S): TOYOTA MOTOR CORP

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001216978	A	20010810	Heisei	H01M008-02

## APPLICATION INFORMATION

STN FORMAT: JP 2000-28619 20000207

ORIGINAL: JP2000028619 Heisei

PRIORITY APPLN. INFO.: JP 2000-28619 20000207

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001

AN 2001-216978 JAPIO

AB PROBLEM TO BE SOLVED: To prevent increase of contact resistance on the surface of a metal separator.

SOLUTION: Electrodes 14a, 14b have a plurality of hard particles 18 bonded on the surface on the side of metal separators 16a, 16b. Each of the hard particles 18 has sufficient conductivity and superior anticorrosiveness, which is formed to be sharp at one side and to be smooth at the other side, the sharp side and the smooth side being directed to the side of the metal separator and to the side of the electrode, respectively. When a **fuel cell** is mounted in a vehicle, if a vehicle body is vibrated, a **relative** slide in the direction of an arrowmark B occurs between each of the metal **separators** 16a, 16b and each of the **electrodes** 14a, 14b, whereby the hard particles 18 in **areas** contacting protruded portions of the metal



**separators** 16a, 16b are slid on the protruded portions of the **separators** 16a, 16b to shave an oxidized coating formed on the surface.

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IC ICM H01M008-02  
ICS H01M004-86

L92 ANSWER 3 OF 15 JAPIO COPYRIGHT 2002 JPO

ACCESSION NUMBER: 1997-265999 JAPIO

TITLE: SOLID ELECTROLYTE TYPE **FUEL CELL** AND ITS MANUFACTURE

INVENTOR: NAGATA MASAKATSU; TAKAOKA MICHIO; ONO MIKIYUKI;  
MOCHIZUKI MASATAKA; IWAZAWA TSUTOMU; YAMAOKA SATORU

PATENT ASSIGNEE(S): FUJIKURA LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09265999	A	19971007	Heisei	H01M008-02

#### APPLICATION INFORMATION

STN FORMAT: JP 1996-76769 19960329

ORIGINAL: JP08076769 Heisei

PRIORITY APPLN. INFO.: JP 1996-76769 19960329

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1997

AN 1997-265999 JAPIO

AB PROBLEM TO BE SOLVED: To provide the solid electrolyte type **fuel cell** enhanced in life characteristics, and also provide its method to easily and efficiently manufacture the solid electrolyte type **fuel cell** by preventing the occurrence of strain due to thermal expansion within an interconnector connected with an air electrode, thereby preventing the occurrence of peeling, and also suppressing an increase in internal electrical resistance.

SOLUTION: The solid electrolyte type **fuel cell** is equipped with an **interconnector** in a multi-layer structure, which is formed out of a first intermediate **area** 31 where a **ratio** of air **electrode** material to a lanthanum-chromite type oxide, is linearly or exponentially inclined, is interposed in an intermediate layer between an air **electrode** 1 and the lanthanum-chromite type oxide, and of a second intermediate **area** 32 where a **ratio** of material for the surface layer 33 of the **interconnector** to a lanthanum-chromite type oxide, is linearly or exponentially inclined, is interposed in an intermediate layer 30 between the surface layer 33 of the interconnector and the lanthanum-chromite type oxide.

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IC ICM H01M008-02  
ICS H01M004-86; H01M004-90; H01M008-12

L92 ANSWER 4 OF 15 JAPIO COPYRIGHT 2002 JPO  
 ACCESSION NUMBER: 1997-161821 JAPIO  
 TITLE: SOLID POLYMER ELECTROLYTIC FUEL CELL  
 INVENTOR: SHINDO YOSHIHIKO  
 PATENT ASSIGNEE(S): FUJI ELECTRIC CO LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09161821	A	19970620	Heisei	H01M008-02

## APPLICATION INFORMATION

STN FORMAT: JP 1995-319864 19951208  
 ORIGINAL: JP07319864 Heisei  
 PRIORITY APPLN. INFO.: JP 1995-319864 19951208  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1997

AN 1997-161821 JAPIO

AB PROBLEM TO BE SOLVED: To suppress the temperature difference in the **electrode** opposed **area** of the **separator** of a cell so that the wet state can be held substantially uniformly, and prevent a local characteristic deterioration.  
 SOLUTION: A plurality of cooling water passing grooves 12 arranged in parallel to each other are provided in the **electrode** opposed **area** of a **separator**, for example, a separator 8A arranged adjacent to a fuel electrode in the same direction as fuel gas passing grooves arranged on the reverse side, and the cooling water guided through a cooling water inlet 18A provided on the upper part of the **electrode** opposed **area** is branched and passed, and discharged through a cooling water outlet 19A provided in the lower part of the **electrode** opposed **area**, whereby a linear temperature gradient from the upper stream to the lower stream is provided, and water quantity is regulated to suppress the temperature difference.

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IC ICM H01M008-02  
 ICS H01M008-10

L92 ANSWER 5 OF 15 JAPIO COPYRIGHT 2002 JPO  
 ACCESSION NUMBER: 1997-045346 JAPIO  
 TITLE: PHOSPHORIC ACID TYPE FUEL CELL  
 INVENTOR: NISHIHARA YOSHINORI  
 PATENT ASSIGNEE(S): FUJI ELECTRIC CO LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09045346	A	19970214	Heisei	H01M008-02

## APPLICATION INFORMATION

STN FORMAT: JP 1995-190018 19950726  
 ORIGINAL: JP07190018 Heisei  
 PRIORITY APPLN. INFO.: JP 1995-190018 19950726  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 1997

AN 1997-045346 JAPIO

AB PROBLEM TO BE SOLVED: To provide a phosphoric acid type **fuel cell** which can hold the prescribed cell service life and can be operated for many hours even if phosphoric acid is not replenished from outside.  
 SOLUTION: A **cathode** catalyst layer 1 is arranged so as to deviate to one side of a **cathode** base material 2, and a reaction **area** and a nonreaction **area** are formed, and a **cathode** reservoir plate 4 having a partition part 43 is inserted and layered between a **separator** 3 and the **cathode** base material 2, and a gas passage which supplies reaction gas to the reaction **area** and discharges it from a nonreaction **area** is formed. Cooling water is supplied from the side end corresponding to the nonreaction area of a cooling pipe 7 embedded in a cooling plate 6, and is discharged from the side end corresponding to the reaction area, and a temperature of the nonreaction area is made **relatively** lower than a temperature of the reaction area.

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IC ICM H01M008-02

L92 ANSWER 6 OF 15 JAPIO COPYRIGHT 2002 JPO

ACCESSION NUMBER: 1997-045344 JAPIO

TITLE: SEPARATOR FOR SOLID ELECTROLYTE **FUEL CELL**

INVENTOR: FUJIMOTO KENJI; TSUNODA ATSUSHI; YOSHIDA TOSHIHIKO

PATENT ASSIGNEE(S): TONEN CORP  
SEKIYU SANGYO KASSEIKA CENTER

## PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09045344	A	19970214	Heisei	H01M008-02

## APPLICATION INFORMATION

STN FORMAT: JP 1995-197488 19950802  
 ORIGINAL: JP07197488 Heisei  
 PRIORITY APPLN. INFO.: JP 1995-197488 19950802  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 1997

AN 1997-045344 JAPIO

AB PROBLEM TO BE SOLVED: To provide a separator for a solid electrolyte **fuel cell** which shows an output characteristic higher than a conventional separator and shows an equal output characteristic even if the size is reduced and which is fit for size

*already known*

reduction and can more easily control the temperature distribution, particularly, the cell in-plane temperature distribution.

SOLUTION: In a separator for a solid electrolyte **fuel cell**, a large number of grooves to constitute a raw material gas passage are arranged at least on one surface. The **area** of a **separator** surface which can be directly contacted with one electrode is adjusted to 20 to 50 % to the whole **area** of the **electrode**.

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IC ICM H01M008-02

L92 ANSWER 7 OF 15 JAPIO COPYRIGHT 2002 JPO

ACCESSION NUMBER: 1995-254417 JAPIO

TITLE: SOLID ELECTROLYTE **FUEL CELL**

INVENTOR: SAKAMOTO SADA AKI; TAKAGI HIROSHI

PATENT ASSIGNEE(S): MURATA MFG CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07254417	A	19951003	Heisei	H01M008-02

#### APPLICATION INFORMATION

STN FORMAT: JP 1994-44010 19940315

ORIGINAL: JP06044010 Heisei

PRIORITY APPLN. INFO.: JP 1994-44010 19940315

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1995

AN 1995-254417 JAPIO

AB PURPOSE: To restrict local irregularity in the pore **ratio** of a porous body at junction parts, restrict polarization of each **electrode**, and improve battery performance by making a pore **diameter** in the junction parts of a fuel **electrode**, and an air **electrode** with an **interconnector** 5 $\mu$ m or less to provide a porous structure of high uniformity in the pore **diameter**.

CONSTITUTION: A solid electrolyte **fuel cell** includes a power generation part 4 comprising layers of a fuel electrode 1, a solid electrolyte film 2, and an air electrode 3 combined on each other to compose a three-layer film, and this acts as the minimum unit of the **fuel cell** to generate electricity by reaction of hydrogen and air supplied from the external. In laminating this power generation part 4, an interconnector 5 is used for parting the power generation parts 4 from each other. A series of grooves 6 are provided in perpendicular directions to each other in both surfaces of the connector 5 to be passages for hydrogen to enter on the fuel electrode 1 side, and for air to enter on the air electrode 3 side. The connector 5 prevents mixing of hydrogen entering into the electrode 1 with air entering into the electrode 3. Junction parts 6a of the fuel electrode 1 and the air electrode 3 with the connector 5 have a porous structure having pores of a diameter of 5 $\mu$ m or less, and having a high

uniformity in the pore diameter.

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IC ICM H01M008-02  
ICS H01M004-86; H01M008-10

L92 ANSWER 8 OF 15 JAPIO COPYRIGHT 2002 JPO  
ACCESSION NUMBER: 1995-006773 JAPIO  
TITLE: COMPOUND ELECTRODE BASE BOARD HAVING DIFFERENT  
RIB HEIGHT AND MANUFACTURE THEREOF  
INVENTOR: FUKUDA HIROYUKI; FUNABASHI MOTOYUKI; SAGI MASUMI  
PATENT ASSIGNEE(S): KUREHA CHEM IND CO LTD  
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07006773	A	19950110	Heisei	H01M008-02

APPLICATION INFORMATION

STN FORMAT: JP 1993-238367 19930924  
ORIGINAL: JP05238367 Heisei  
PRIORITY APPLN. INFO.: JP 1993-238367 19930924  
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
Applications, Vol. 1995

AN 1995-006773 JAPIO

AB PURPOSE: To obtain a compact electrode base board for **fuel cell**, which has the excellent phosphoric acid resistance, and to enhance handling performance in manufacturing.  
CONSTITUTION: A compound electrode base board is formed of a separator 1 made of fine carbon material, two porous carbonaceous electrode parts 2, of which one surface is provided with plural grooves and of which the other surface is formed flat, and end seal parts 3 made of fine carbon material. In this electrode base board for **fuel cell**, the electrode parts 2 are bonded on both surfaces of the separator 1 with the tetrafluoroethylene resin dispersion 4, and the end seal parts 3 are bonded to the **separator** 1, which is extended outside from the peripheral edge of the **electrode** parts 2, through the tetrafluoroethylene resin layer 4. An **area ratio** between reaction gas passages 5, 6 arranged in the fuel **electrode** and the air **electrode** is set at 1:3 to 2:3.

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IC ICM H01M008-02  
ICS H01M004-88

L92 ANSWER 9 OF 15 JAPIO COPYRIGHT 2002 JPO  
ACCESSION NUMBER: 1994-349506 JAPIO  
TITLE: SOLID ELECTROLYTIC **FUEL CELL**  
INVENTOR: TANIGUCHI SHUNSUKE; AKIYAMA YUKINORI; ISHIDA NOBORU; YASUO KOJI; SAITO TOSHIHIKO  
PATENT ASSIGNEE(S): SANYO ELECTRIC CO LTD  
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 06349506	A	19941222	Heisei	H01M008-02

## APPLICATION INFORMATION

STN FORMAT: JP 1993-133396 19930603  
 ORIGINAL: JP05133396 Heisei  
 PRIORITY APPLN. INFO.: JP 1993-133396 19930603  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1994

AN 1994-349506 JAPIO

AB PURPOSE: To allow stable retaining for a long time and improve **differential** pressure resistance by bounding sealant-retained porous layers to the vicinity of the outer periphery of an electrode, where a gas seal area is formed.  
 CONSTITUTION: Preset pieces of plane cells 8 are respectively laminated between preset pieces of separators 10 and fastened up and down with a pair of stack plates. On the solid electrolyte 1 of the cell 8, porous layers 7 are bonded to the peripheries on the cathode side of manifold holes 3, 4 formed in the separator 10, the peripheries on the anode side of manifold holes 5, 6 and the outer periphery of an electrolyte plate 1. The porous layer 7 has the same composition as the electrolyte plate 1, with a seal area formed where sealant is retained. The thickness of the porous layer 7 is determined so that a space between the rib 11 of the **separator** 10 and an electrode can be secured to supply **anode** gas and **cathode** gas to the **electrode**.  
 . In this way, the sealant can be stably retained for a long time and the seal **area** 12 excellent in **differential** pressure resistance can be obtained.

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IC ICM H01M008-02  
 ICS H01M008-12

L92 ANSWER 10 OF 15 JAPIO COPYRIGHT 2002 JPO  
 ACCESSION NUMBER: 1994-267553 JAPIO  
 TITLE: CHLORINE SIDE ELECTRODE OF METAL-CHLORINE FUEL CELL AND THE METAL-CHLORINE FUEL CELL  
 INVENTOR: KITAMURA HISAHIRO; SHIBATA KIYOSHI  
 PATENT ASSIGNEE(S): NIPPON STEEL CORP  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 06267553	A	19940922	Heisei	H01M008-02

## APPLICATION INFORMATION

STN FORMAT: JP 1993-51115 19930311  
 ORIGINAL: JP05051115 Heisei  
 PRIORITY APPLN. INFO.: JP 1993-51115 19930311

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1994

AN 1994-267553 JAPIO

AB PURPOSE: To secure a large **electrode area**, and to compose a metal-chlorine **fuel cell** with a light metal, by integrating a collector material and an electrolyte holding material, and providing a **separator** between the metal and the chlorine, as to reduce the distance between electrodes.  
 CONSTITUTION: A ceramics material of an oxide with a **relatively** large porosity can be permeated in a molten salt to be the electrolyte of a **fuel cell** at a high temperature condition, and held stably. By using a material having such a characteristics, a collector material 7 of a mesh form carbon fiber is provided on one side surface of a porous material 8 impregnating a molten salt, so as to compose a carbon side electrode. Such a slit electrode is fitted to a conductive holder 10 which can feed the gas, and the side where the electrode 15 is not provided is adhered closely to a metal material so as to compose a battery. In the electrode structure made by integrating such a collector material 7 and the electrolyte, the area to contact with the chlorine gas and the electrolyte is limited, and the abrasion of a container material can be avoided. Consequently, the distance between the chlorine **electrode** and the metallic **electrode** can be reduced by a **separator**, a large **electrode area** can be secured, and the battery can be composed of a light metal.  
 COPYRIGHT: (C)1994,JPO&Japio  
 IC ICM H01M008-02  
 ICS H01M008-22

L92 ANSWER 11 OF 15 JAPIO COPYRIGHT 2002 JPO

ACCESSION NUMBER: 1988-048766 JAPIO

TITLE: COMPOSITE ELECTRODE SUBSTRATE HAVING DIFFERENT RIB HEIGHT AND ITS MANUFACTURE

INVENTOR: FUKUDA HIROYUKI; FUNABASHI MOTOYUKI; SAGI MASUMI

PATENT ASSIGNEE(S): KUREHA CHEM IND CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 63048766	A	19880301	Showa	H01M008-02

#### APPLICATION INFORMATION

STN FORMAT: JP 1986-190959 19860814  
 ORIGINAL: JP61190959 Showa  
 PRIORITY APPLN. INFO.: JP 1986-190959 19860814  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1988

AN 1988-048766 JAPIO

AB PURPOSE: To obtain a composite electrode substrate meeting the requirements of actual **fuel cell** by specifying

the **ratio** of the cross section area of a fuel gas passage to that of an air gas passage.

CONSTITUTION: The **ratio** of the cross section **area** of a fuel gas passage 5 in fuel **electrode** side to that of an air passage 6 on air **electrode** side each of which is formed by a **separator** 1 and the groove of a porous carbon electrode 2 is specified to  $1:3 \sim 2:3$ . Although the shape of the cross section of the reaction gas passage is optional, the cross section area is changed by varying the height of the fuel passage and the air passage having the same width from the standpoint of the possibility of a thin electrode substrate, cell performance, and mechanical strength. Thereby, a composite electrode substrate for **fuel cell** meeting the requirements of actual fuel can be obtained.

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IC ICM H01M008-02

L92 ANSWER 12 OF 15 JAPIO COPYRIGHT 2002 JPO  
 ACCESSION NUMBER: 1988-010469 JAPIO  
 TITLE: STACKED **FUEL CELL**  
 INVENTOR: MITSUTA KENRO; HOSOKAWA JUNICHI; HIRATA IKUYUKI;  
 MURAHASHI TOSHIAKI  
 PATENT ASSIGNEE(S): MITSUBISHI ELECTRIC CORP  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 63010469	A	19880118	Showa	H01M008-02

#### APPLICATION INFORMATION

STN FORMAT: JP 1986-153367 19860630  
 ORIGINAL: JP61153367 Showa  
 PRIORITY APPLN. INFO.: JP 1986-153367 19860630  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1988

AN 1988-010469 JAPIO

AB PURPOSE: To minimize a gas diffusion obstruction and to obtain the sufficient amount of electrolyte reserve and gas diffusion capability by installing a  $0.3 \sim 0.5$ mm thick oxidizing agent electrode substrate to which water repellent treatment is applied and a  $0.8 \sim 3.2$ mm thick fuel electrode substrate to which no water repellent treatment is applied, and an external reservoir having porous base material.

CONSTITUTION: A  $0.3 \sim 0.5$ mm thick oxidizing agent electrode substrate 5 to which water repellent treatment is applied, and a  $0.8 \sim 3.2$ mm thick fuel electrode substrate 2 to which no water repellent treatment is applied, and an external reservoir 26 which is mounted to a gas separating plate 10 and is in contact with the fuel electrode substrate 2 and has porous base material are installed. The gas diffusion obstruction within the substrates is minimized, and the sufficient amount of electrolyte reserve and gas diffusion capability are obtained. Since the **region** where



gas sealing is required is slightly larger than a rib- installed **separator** type but far small **compared** with a rib-installed **electrode** type or hybrid type, gas sealing is easy. The reserving function of the fuel electrode substrate 2 is increased and supplement of electrolyte from the outside is made easy.

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IC ICM H01M008-02  
ICS H01M004-86

L92 ANSWER (13) OF 15 JAPIO COPYRIGHT 2002 JPO  
ACCESSION NUMBER: 1987-086666 JAPIO  
TITLE: **FUEL CELL**  
INVENTOR: FUJIMURA HIDEKAZU; ITO SHOJI  
PATENT ASSIGNEE(S): HITACHI LTD  
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 62086666	A	19870421	Showa	H01M008-02

#### APPLICATION INFORMATION

STN FORMAT: JP 1985-223568 19851009  
ORIGINAL: JP60223568 Showa  
PRIORITY APPLN. INFO.: JP 1985-223568 19851009  
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1987

AN 1987-086666 JAPIO

AB PURPOSE: To aim at expansion of the effective reaction area of a porous body electrode and accelerate the diffusion of gas to the inside of the electrode as well as to aim at a sharp improvement in cell output, by forming each hole of the electrode into various hole diameters in size.

CONSTITUTION: An electrode 2 is a porous structural body made up of sintering fine powder of metal (Ni) and metal oxide (NiO). An electrode part 13 is constituted of a grain small in a grain diameter, while its specific surface also is large enough, and a surface of the electrode 2 is favorably wet by an electrolyte solution out of an electrolytic late,1 thus this part is a zone where electrochemical reaction is most actively carried out A diameter of each grain grows large in **proportion** as it goes toward a **separator** 4 from the electrolytic plate 1, and a hole **diameter** also **proportionally** grows large, therefore a hole 14 is strong in a function as a passage of gas 30. An intermediate part 15 of the **electrode** 2 effectively works even as an electrode reaction part, and it comes to a most favorable zone for diffusion of the gas 30. With this constitution, all parts where the electrode is wet come to an electrode effective area, while all other than spots dipped in the electrolyte solution come to gas passages, whereby the gas diffusion is accelerate, meaning that it leads to improvement in cell output.  
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IC ICM H01M008-02

L92 ANSWER 14 OF 15 JAPIO COPYRIGHT 2002 JPO  
 ACCESSION NUMBER: 1986-253768 JAPIO  
 TITLE: ELECTRODE SUBSTRATE FOR FUEL  
 CELL AND ITS MANUFACTURE  
 INVENTOR: KAJI HISATSUGU; SAITO KUNIYUKI  
 PATENT ASSIGNEE(S): KUREHA CHEM IND CO LTD  
 PATENT INFORMATION:

*Viewed*  
*US 4794043*

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 61253768	A	19861111	Showa	H01M008-02

## APPLICATION INFORMATION

STN FORMAT: JP 1985-93495 19850430  
 ORIGINAL: JP60093495 Showa  
 PRIORITY APPLN. INFO.: JP 1985-93495 19850430  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 1986

AN 1986-253768 JAPIO

AB PURPOSE: To produce an **electrode** substrate having minimal defects such as warp, cracks or separation by specifying both the **ratio** of the total **area** of the cross sections (parallel to the **separator**) of many carbonaceous projections to the total **area** of the **electrode** and the distance between adjacent projections.  
 CONSTITUTION: The **ratio** of the total **area** (Sr) of the cross sections (parallel to a **separator** 1) of carbonaceous projections 3 to the total **area** (Se) of the **electrode** is adjusted to  $1/5 \sim 4/5$ . The distance (d) between adjacent projections 3 is adjusted to be at most 10mm so that appropriate reaction gas flow paths are formed. The carbonaceous projections 3 are made of a homogeneous carbonaceous material. It is preferable that the average bulk density of the projections 3 be  $0.40 \sim 1.8 \text{ g/cm}^3$ .  
 COPYRIGHT: (C)1986, JPO&Japio

IC ICM H01M008-02

ICS H01M004-88; H01M004-96

L92 ANSWER 15 OF 15 JAPIO COPYRIGHT 2002 JPO  
 ACCESSION NUMBER: 1982-107569 JAPIO  
 TITLE: FUEL CELL AND ITS

MANUFACTURE  
 INVENTOR: KUWABARA TAKESHI; SEKI TOSHIAKI; HAYASHI  
 HIROSHI; TAKECHI TAICHI  
 PATENT ASSIGNEE(S): TOSHIBA CORP  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 57107569	A	19820705	Showa	H01M008-02

## APPLICATION INFORMATION

STN FORMAT: JP 1980-182142 19801224  
ORIGINAL: JP55182142 Showa  
PRIORITY APPLN. INFO.: JP 1980-182142 19801224  
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
Applications, Vol. 1982

AN 1982-107569 JAPIO

AB PURPOSE: To manufacture a thin, large area, stable separator for **fuel cells** with **relatively** higher electric conductivity by pree-molding expanded graphite made from graphite interlayer compound to from a sheet, and impregnating it with phenol resin varnish.  
CONSTITUTION: Graphite interlayer compound is quickly heated at  $900 \sim 1,000^{\circ}\text{C}$  or agent-heated to expand, and the expanded graphite is press-molded to form a sheet with a thickness of  $0.1 \sim 2\text{mm}$ . Then the graphite sheet is impregnated with a phenol resin varnish. A unit **cell** for **fuel cells** is constituted using a separator 18 obtained, and ribbed substrates 19 in which an **electrode** 2 and a rib 4, and an **electrode** 3 and a rib 5 are combined separately. This **separator** is thin, large- **sized**, and light in weight, thus the **fuel cell** is light in weight. The thermal loss due to ohmic drop is reduced, and the thermal efficiency of the **fuel cell** can be improved.

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IC ICM H01M008-02  
ICS H01M008-24

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L93 ANSWER 1 OF 10 JICST-EPlus COPYRIGHT 2002 JST

AN 101078793 JICST-EPlus

TI Fabrication and Evaluation of Electrode Supported Planar SOFC III. Stack Performance.

AU MURATA K; SHIMOTSU M


CS Mitsui Engineering & Shipbuilding Co., Ltd., Okayama, Jpn

SO Denki Kagaku oyobi Kogyo Butsuri Kagaku, (2001) vol. 69, no. 8, pp. 587-591. Journal Code: G0072A (Fig. 10, Tbl. 3, Ref. 11)

ISSN: 1344-3542

CY Japan

DT Journal; Article  
LA English  
STA New  
AB A fuel-electrode-supported planar cell with an effective electrode area of 150 cm<sup>2</sup> was developed. A three-cell stack was built with ceramic gas separators with an electric resistance lower than 5 m.OMEGA.. An electric power generation test was carried out at 1000.DEG.C. with hydrogen gas and air which were fed to the cells in series. The stack attained a maximum output power of 106 W at a fuel utilization of 70%. (author abst.)  
CC YB04040V (621.352.6)  
CT laminate structure; high temperature fuel cell; surface area; electric resistance; separator(equipment); hydrogen; air; output; performance; fuel; electrode; solid electrolyte; ceramics; yttrium oxide; zirconium oxide  
BT multistory structure; structure; fuel cell; chemical cell; battery; area; geometric quantity; resistance; equipment; element; gas; input-output; electrolyte; matter; yttrium compound; rare earth element compound; transition metal compound; metal oxide; oxide; chalcogenide; oxygen group element compound; oxygen compound; zirconium compound; 4A group element compound  
ST SOFC(cell); YSZ(ceramic)

L93 ANSWER 2 OF 10 JICST-EPlus COPYRIGHT 2002 JST   
AN 980849608 JICST-EPlus  
TI World's first kW power generation succeeded by inside modified system of plane solid electrolyte fuel cell.  
SO Nippon Gasu Kyokaishi (Journal of the Japan Gas Association), (1998) vol. 51, no. 9, pp. 58-59. Journal Code: F0883A (Fig. 1)  
CODEN: NIPGAM; ISSN: 0029-0211  
CY Japan  
DT Journal; Commentary  
LA Japanese  
STA New  
AB The world's first kW class (1.68KW) output was successfully achieved with direct use of methane. Fuel cell and inside reforming are explained. The system adopted is direct addition of methane and reformed steam at 1,000.DEG.C. with parallel connection of two cells, in which single cells of 12 cm square and 100cm<sup>2</sup> electrode surface area are laminated in 48 layers. The inside reforming was realized by compound separator use with alumina, which enabled 80% combined efficiency. In future, utilization is expected to expand from a home-use small cogenerator to business and industrial uses. Research and development are aiming at kept with the aim of the practical application for small SOFC system in future.  
CC NB03140M; YB04040V (621.311.2+; 621.352.6)  
CT solid fuel cell; steam reforming; process synthesis; cell structure; monolithic structure; laminate structure; assembly; performance test; demonstration experiment; performance evaluation; technology development; special power generation; alkane

BT **fuel cell**; chemical cell; battery; reforming; gasification; modification; synthesis; metal structure(microstructure); organization; structure; multistory structure; test; experiment; evaluation; research and development; development; power generation; electric power energy operation; aliphatic hydrocarbon; hydrocarbon

L93 ANSWER 3 OF 10 JICST-EPlus COPYRIGHT 2002 JST ho  
 AN 970592062 JICST-EPlus  
 TI Development of an external manifold type PEFC module.  
 AU MITSUDA KENRO; MAEDA HIDEO; FUKUMOTO HISATOSHI; URUSHIBATA HIROAKI  
 ENAMI MASAO; TAKASU KAZUHIKO  
 CS Mitsubishi Electric Corp.  
 New Energy and Ind. Technol. Dev. Organ.  
 SO Nenryo Denchi Shinpojiumu Koen Yokoshu (FCDIC Fuel Cell Symposium Proceedings), (1997) vol. 4th, pp. 103-106. Journal Code: L2407A (Fig. 8, Ref. 9)  
 CY Japan  
 DT Conference; Short Communication  
 LA English  
 STA New  
 AB Methanol reformed 10kW class PEFC power systems for portable use have been developing under NEDO's five-year R&D program since FY 1996. In this paper, post test results of a single cell after continuous operation of 9300hrs (operated with hydrogen and air) are reported. The main reason for the decay of the cell voltage was growth of platinum particle size and contamination of cations originated probably from metal gas pipes and water. As a countermeasure of CO poisoning, external manifold type PEFC modules are developed, which has distributed fuel inlets and serpentine gas channels in the plane of a cell. Due to the CO poisoning, **anode** reactions are concentrated into the fuel inlet **area** occurs. However, the new gas **separator** has an effect to distribute the **anode** reactions in the plane. Three-cell stack and thirty-cell stack were designed and assembled. Those external manifold type PEFC stacks are also introduced. (author abst.)

CC YB04040V (621.352.6)  
 CT gas **fuel cell**; solid electrolyte; polyelectrolyte; manifold(tube); hydrogen; catalytic reforming; reformer(chemical reactor); degradation; catalyst poison; module; carbon monoxide; **fuel cell**; aliphatic alcohol

BT chemical cell; battery; electrolyte; matter; functional polymer; macromolecule; pipe classified by morphology; pipe; element; reforming; petroleum refining; purification; chemical equipment; equipment; furnace; alteration; variation; carbon oxide; oxide; chalcogenide; oxygen group element compound; oxygen compound; carbon compound; carbon group element compound; alcohol; hydroxy compound

L93 ANSWER 4 OF 10 JICST-EPlus COPYRIGHT 2002 JST so  
 AN 970487692 JICST-EPlus  
 TI Power Generation Technology. A Few Studies on the Improvement of the

## Generation Efficiency in Solid Oxide Fuel Cell.

- AU KONDO MASAYOSHI; YANO JUN; SHIRAKI TAKASHI; TATSUMI HIROSHI; TOMONO YUTAKA; FURUKAWA TETSURO
- CS Hitachi Zosen Tech. Res. Lab. Inc.
- SO Hitachi Zosen Giho (Hitachi Zosen Technical Review), (1997) vol. 58, no. 1, pp. 50-54. Journal Code: F0063A (Fig. 15, Tbl. 3, Ref. 5)  
CODEN: HZOGA2; ISSN: 0018-2788
- CY Japan
- DT Journal; Article
- LA Japanese
- STA New
- AB Solid Oxide Fuel Cell (SOFC) is expected to be an important source of energy in the future, because it has higher energy efficiency in **comparison** with other types of **fuel cells**. However, SOFC has a few technical problems such as long-term stability for the generation of electric power and gas shield structures between oxygen and hydrogen. This paper presents the application of a ceramics coating on the heat resistant alloy for a **separator** and the reduction of the electric resistance of Ni-ZrO<sub>2</sub> cermet for a fuel **electrode** in order to improve the generation efficiency of SOFC for long-term use. In addition, a 100mm\*100mm squared type SOFC (effective electrode **area** is 5800mm<sup>2</sup>) with 5 layers of planer cells is assembled and its generation efficiency is evaluated. (author abst.)
- CC YB04040V (621.352.6)
- CT solid **fuel cell**; heat resistant alloy; cermet; separator(equipment); durability; electric resistance; cogeneration; plate structure; zirconium oxide; ceramic coating
- BT **fuel cell**; chemical cell; battery; alloy; metallic material; ceramics; equipment; resistance(endure); resistance; power generation; electric power energy operation; structure; metal oxide; oxide; chalcogenide; oxygen group element compound; oxygen compound; zirconium compound; 4A group element compound; transition metal compound; covering; surface treatment; treatment
- L93 ANSWER 5 OF 10 JICST-EPlus COPYRIGHT 2002 JST
- AN 970225671 JICST-EPlus
- TI Development of PEFC modules with high ion conductive electrodes.
- AU HAMADA AKIRA; KANEKO MINORU; MATSUBAYASHI TAKAAKI; NAKAOKA TOORU; MIYAKE YASUO; NISHIO KOJI
- ENAMI MASAO; TAKASU KAZUHIKO
- CS SANYO Electr. Co., Ltd.  
NEDO
- SO Nenryo Denchi Shinpojiumu Koen Yokoshu (FCDIC Fuel Cell Symposium Proceedings), (1996) vol. 3rd, pp. 265-268. Journal Code: L2407A (Fig. 7, Tbl. 1, Ref. 2)
- CY Japan
- DT Conference; Article
- LA Japanese
- STA New

AB Cell components of the PEFC module were studied to improve the module performance in a high air utilization region. The **relationship** between cell performance and air flow speed through the gas channels of the gas **separator** was examined by single cells. It was found that the cell performance in a high air utilization **region** was improved by selecting air channel configuration in which high air flow speed was obtained. The **cathode** backing paper also modified by controlling the Teflon amount added to the backing paper. The modification of the gas channel configuration and the cathode backing paper was carried out in a 200cm<sup>2</sup>\*20-cell module and a consequent 200cm<sup>2</sup>\*36-cell module. Performance of both modules in a high air utilization region was remarkably improved and power density more than 0.3W/cm<sup>2</sup> was achieved even for 200cm<sup>2</sup>\*36-cell module in which the platinum amount of the cells was decreased to 1.1mg/cm<sup>2</sup>. (author abst.)

CC YB04040V (621.352.6)

CT polyelectrolyte; **fuel cell**;

polytetrafluoroethylene; performance test; platinum; flow velocity; current collector; cation exchange resin; channel  
BT functional polymer; macromolecule; electrolyte; matter; chemical cell; battery; fluorocarbon resin; thermoplastic; plastic; fluorine-containing polymer; halogen-containing polymer; polymer; test; platinum group metal; transition metal; metallic element; element; velocity; equipment; rolling stock apparatus; ion exchange resin; ion exchanger(material); route

L93 ANSWER <sup>6</sup> OF 10 JICST-EPlus COPYRIGHT 2002 JST

AN 950348581 JICST-EPlus

TI Development of Solid Oxide **Fuel Cells**.

AU IWATA TOMOO; KOSEKI KAZUO

CS Fuji Electr. Corp. Res. & Dev. Ltd.

SO Fuji Jiho (Fuji Electric Journal), (1995) vol. 68, no. 3, pp.

160-163. Journal Code: F0080A (Fig. 10, Tbl. 1, Ref. 6)

CODEN: FUJIAS; ISSN: 0367-3332

CY Japan

DT Journal; Commentary

LA Japanese

STA New

AB Since 1989, Fuji Electric has continued developing substrate-type, planar, solid oxide **fuel cells** commissioned by NEDO(New Energy and Industrial Technology Development Organization). In 1991, a 410W, 10-cell stack with an **electrode area** of 200cm<sup>2</sup> using cermet cells and ceramic **separators** ran for 2,000h. In 1993, a 500cm<sup>2</sup> cermet cell without ribs ran at 100W for 500h, and in addition, a 200cm<sup>2</sup> cermet cell without ribs and with a Ni-Cr alloy metallic separator showed good heat cycle performance for 5 runs. Since 1994, a metallic cell with a porous Ni-Cr alloy substrate has been under development. (author abst.)


CC YB04040V (621.352.6)


CT **fuel cell**; solid electrolyte; fuel electrode;

oxygen electrode; zirconium oxide; nickel; cermet; functional

ceramics

BT chemical cell; battery; electrolyte; matter; electrode; metal oxide; oxide; chalcogenide; oxygen group element compound; oxygen compound; zirconium compound; 4A group element compound; transition metal compound; fourth row element; element; iron group element; transition metal; metallic element; ceramics

L93 ANSWER 7 OF 10 JICST-EPlus COPYRIGHT 2002 JST   
AN 930004348 JICST-EPlus  
TI A development of solid electrolyte **fuel cell**.  
AU HASHIMOTO KEIICHI; YAMAGUCHI RYUICHI  
CS Saibu Gas Co., Ltd.  
SO Nippon Gasu Kyokaishi (Journal of the Japan Gas Association), (1992) vol. 45, no. 10, pp. 180-182. Journal Code: F0883A (Fig. 7, Tbl. 1) CODEN: NIPGAM; ISSN: 0029-0211  
CY Japan  
DT Journal; Commentary  
LA Japanese  
STA New  
AB From the viewpoint of a cylinder vertical stripe type, a method for making SOFC using a porous electrode hanger tube by wet method is examined. A manufacture flow of a cell of two types of fuel electrode and air electrode are explained with diagram as an **electrode** hanger tube. Special property of power generation of an **electrode** hanger tube is explained. It is reported that it lengthens a simple cell and examines **area** expansion and stack of a cell by an **interconnector**. Improvement in output is expected.  
CC YB04040V (621.352.6)  
CT solid electrolyte; gas **fuel cell**; fuel electrode; porous medium; output; voltage; current density; hydrogen; oxygen; solid electrolyte **fuel cell**  
BT electrolyte; matter; **fuel cell**; chemical cell; battery; electrode; porous object; input-output; density; element; oxygen group element; second row element

L93 ANSWER 8 OF 10 JICST-EPlus COPYRIGHT 2002 JST   
AN 910494149 JICST-EPlus  
TI Design and fabrication of large-sized separator for MCFC (Molten carbonate **fuel cell**).  
AU OTSUBO MITSUO; KATO YUJI; ZAIMA NOBUYUKI; TEZUKA ATSUSHI  
CS KASA SHUNJI; SHIMA TAKENOBU  
CS Ishikawajima-Harima Heavy Industries Co., Ltd.  
Ishikawajima-Harima Heavy Industries Co., Ltd., Res. Inst.  
SO Ishikawajima Harima Giho (Ishikawajima Harima Engineering Review), (1991) vol. 31, no. 2, pp. 102-108. Journal Code: F0090A (Fig. 8, Tbl. 2, Ref. 3) CODEN: ISHGAV; ISSN: 0578-7904  
CY Japan  
DT Journal; Article  
LA Japanese  
STA New



AB Power generating capacity of one MCFC stack will be required to scale up its commercial operation in future. Development of large-sized **separators** and multi-layered stacks can respond to the requirement. Under the support of NEDO, IHI has studied and developed the design and fabrication of large-sized **separators** having one square meter of **electrode area**, which were used for power generating tests and brought satisfactory results. Now the number of **separators** being fabricated are small and not on a mass-production basis, but the design and fabrication method have been considered for future requirements. Thickness of a separator is less than 6mm to enable stacking multi-cells compactly and the fabrication method can afford mass-production. The large-sized separators will be used for the planned 100kW stack. (author abst.)

CC YB04040V (621.352.6)

CT **fuel cell**; separator(equipment); surface area; large type; structural design; production technology; laminate structure; pressure loss; performance test; measurement data; data analysis; flow velocity; superficial velocity; flow rate; distribution and partition; performance analysis; system model; weldability test

BT chemical cell; battery; equipment; area; geometric quantity; type; design; technology; multistory structure; structure; loss; test; data; analysis; velocity; model

L93 ANSWER <sup>9</sup> OF 10 JICST-EPlus COPYRIGHT 2002 JST *no*

AN 910079899 JICST-EPlus

TI Development of on-site **fuel cell** power units:  
**Fuel cell** stacks.

AU HIROTA TOSHIO; NAKAJIMA NORIYUKI

CS Fuji Electric Corp. Res. and Development Ltd.

SO Fuji Jiho (Fuji Electric Journal), (1990) vol. 63, no. 11, pp. 731-732. Journal Code: F0080A (Fig. 2, Tbl. 1)  
CODEN: FUJIAS; ISSN: 0367-3332

CY Japan

DT Journal; Commentary

LA Japanese

STA New

AB To put on-site **fuel cell** power plants to practical use, it is essential to reduce the size, weight, and cost of **fuel cell** stacks that are the largest, heaviest, and costliest parts. Improvement in reliability and maintainability is also important. Fuji Electric has achieved various developments, such as reduction of the **electrode area** and the number of cells by high **electrode** output density, development of **electrode** substrates and **separators** for it, reduction of the **size** and weight of structural parts, and improvements in reliability. This paper describes the current state of the developments. (author abst.)

CC YB04040V; NB03140M (621.352.6; 621.311.2+)

CT **fuel cell**; direct power generation; power

- generating installation; structural design; mechanism element  
 BT chemical cell; battery; power generation; electric power energy  
 operation; electric installation; facility; design; parts
- L93 ANSWER (10) OF 10 JICST-EPlus COPYRIGHT 2002 JST  
 AN 900257522 JICST-EPlus  
 TI Development of MCFC(molten carbonate **fuel cell**) *ho*  
 of large area electrode.  
 AU ZAIMA NOBUYUKI; KAKIHARA TOSHIAKI; MATSUYAMA TOSHIYA; SUZUKI AKIRA  
 MORITA TETSUYUKI  
 CS Ishikawajima-Harima Heavy Industries Co., Ltd.  
 Ishikawajima-Harima Heavy Industries Co., Ltd., Res. Inst.  
 SO Ishikawajima Harima Giho (Ishikawajima Harima Engineering Review),  
 (1990) vol. 30, no. 1, pp. 1-7. Journal Code: F0090A (Fig. 19, Tbl.  
 1, Ref. 3)  
 CODEN: ISHGAV; ISSN: 0578-7904  
 CY Japan  
 DT Journal; Article  
 LA Japanese  
 STA New  
 AB MCFC shows a high efficiency of energy conversion for power  
 generation. IHI has been making much effort to enlarge electrode  
 area, considering it as one of the most important technologies for  
 commercialization of MCFC. In recent years, IHI has accomplished the  
 power generation of MCFC stacks of the largest **electrode**  
**area** in the world. Since 1987, under the support of NEDO,  
 IHI has been developing the MCFC of the large **size**  
 rectangular **electrode**. With the fabrication technique both  
 of the large **electrode** and of large **separator**  
 made of thin metal sheet, the cell with a 1m<sup>2</sup> **electrode**  
**area** was manufactured and power generation was achieved with  
 10kW class stack. This stack generated 9.5kW and was operated for  
 2250 hours. In this report, the MCFC stack of large electrode area  
 was mentioned. (author abst.)  
 CC YB04040V (621.352.6)  
 CT carbonate(salt); molten salt; high temperature **fuel**  
**cell**; technology development; electrode; separator(plate);  
 capacity; current density  
 BT carbon oxoate; oxoate; oxygen compound; oxygen group element  
 compound; carbon compound; carbon group element compound; liquid;  
**fuel cell**; chemical cell; battery; research and  
 development; development; plate classified by application;  
 plate(material); density

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L94 ANSWER 1 OF 3 COMPENDEX COPYRIGHT 2002 EEI no  
 AN 1999(8):5905 COMPENDEX  
 TI Study of a corrosion-resistant coating for a separator for a molten carbonate **fuel cell**.  
 AU Hwang, E.R. (Hanyang Univ, Seoul, S Korea); Kang, S.G.  
 SO Journal of Power Sources v 76 n 1 Nov 1 1998.p 48-53  
 CODEN: JPSODZ ISSN: 0378-7753  
 PY 1998  
 DT Journal  
 TC Experimental  
 LA English  
 AB The corrosion behaviour of nickel and copper coatings in the current-collector **area** of **separators** and a Ni/Al intermetallic compound coating in the wet-seal **area** of **separators** for molten carbonate **fuel cells** is evaluated under immersion in molten carbonate salt. The corrosion-protection effect of nickel and copper coatings on 316L stainless steel is evaluated in an electrochemical half-cell by means of a potentiostatic polarization technique. In addition, the corrosion-protection behaviour of a nickel-coated layer in the **anode** current-collector **area** and a Ni/Al-coated layer in the wet-seal **area** of the **separator** are studied during operation of a single cell for 10 days. Nickel suffers no observable corrosive attack for up to 500 h in the anode gas atmosphere (H<sub>2</sub>/CO<sub>2</sub>). By contrast, nickel and copper exhibit less corrosion resistance than 316L stainless-steel during exposure to the cathode gas atmosphere (CO<sub>2</sub>/O<sub>2</sub>). Under a potentiostatic anodic polarization of minus 1.0 V (versus CO<sub>2</sub>/O<sub>2</sub>/Au), nickel-coated 316L stainless-steel displays a lower anodic current density than copper-coated and uncoated 316L stainless-steel. NiAl with a high melting point has better corrosion resistance than other Ni/Al intermetallic compounds. From single cell tests, it is found that nickel and NiAl coatings are efficient for the protection of stainless-steel in the **anode area** and wet-seal area, respectively. (Author abstract) 12 Refs.  
 CC 702.2 Fuel Cells; 813.2 Coating Materials; 539.1 Metals Corrosion; 802.1 Chemical Plants and Equipment; 804.2 Inorganic Components  
 CT \***Fuel cells**; Stainless steel; Separators; Carbonates; Nickel; Copper; Intermetallics; Corrosion protection; Coatings; Corrosion resistance  
 ST Molten carbonate **fuel cell**; Potentiostatic polarization technique; Molten carbonate salt  
 ET Ni; C\*H\*O; H<sub>2</sub>/CO<sub>2</sub>; H cp; cp; C cp; O cp; C\*O; CO<sub>2</sub>/O<sub>2</sub>; C\*Au\*O; CO<sub>2</sub>/O<sub>2</sub>/Au; Au cp; Al\*Ni; Al sy 2; sy 2; Ni sy 2; NiAl; Ni cp; Al cp

- L94 ANSWER 2 OF 3 COMPENDEX COPYRIGHT 2002 EEI  
 AN 1996(34):800 COMPENDEX  
 TI Influence of rib spacing in proton-exchange membrane electrode assemblies.  
 AU West, A.C. (Columbia Univ, New York, NY, USA); Fuller, T.F.  
 SO Journal of Applied Electrochemistry v 26 n 6 Jun 1996.p 557-565  
 CODEN: JAELBJ ISSN: 0021-891X  
 PY 1996  
 DT Journal  
 TC Theoretical; Experimental  
 LA English  
 AB A two-dimensional design analysis of a membrane-electrode assembly for a proton-exchange membrane **fuel cell** is presented. Specifically, the ribs of the bipolar plates restrict the access of fuel and oxidant gases to the catalyst layer. The expected change in cell performance that results from the partial blocking of the substrate layer is studied by numerical simulation of the oxygen **electrode** and the membrane **separator**. The effects of rib **sizing** and the thickness of the gas-diffusion **electrode** on the current and water distributions within the cell are presented. For all of the cases considered, the two-dimensional effect only slightly alters the half-cell potential for a given applied current but has a significant influence on water management. Concentrated solution theory with variable transport properties is used in the membrane electrolyte to solve for the electrical potential and local water content. The Stefan-Maxwell equations are used in the gas-diffusion electrode to determine the local mole fractions of nitrogen, oxygen and water vapour. A control-volume formulation is used for the resolution of the coupled nonlinear **differential** equations. One advantage of the control-volume approach over finite-difference methods is the **relative** ease in which internal boundary points in **fuel-cell** and battery models are handled. This and other advantages are briefly discussed. (Author abstract) 17 Refs.
- CC 702.2 Fuel Cells; 802.1 Chemical Plants and Equipment; 801.4.1 Electrochemistry; 931.2 Physical Properties of Gases, Liquids and Solids; 723.5 Computer Applications; 931.3 Atomic and Molecular Physics
- CT \*Electrochemical electrodes; **Differential** equations; **Fuel cells**; Gases; Computer simulation; Transport properties; Maxwell equations; Electrolytes; Ion exchange membranes; Protons
- ST Membrane electrode assembly; Rib sizing; Gas diffusion electrodes; Control volume formulation
- L94 ANSWER 3 OF 3 COMPENDEX COPYRIGHT 2002 EEI  
 AN 1989(11):115634 COMPENDEX DN 8911116792  
 TI Project for the electrochemical production and utilization of hydrogen in Brazil.  
 AU Gonzalez, E.R. (Inst de Fisica e Quimica de Sao Carlos, Sao Carlos, Braz); Ticianelli, E.A.; Tanaka, A.A.; Avaca, L.A.  
 SO Energy Sources v 11 n 1 1989 p 53-58

CODEN: EGYSAO ISSN: 0090-8312  
PY 1989  
DT Journal  
TC Experimental  
LA English  
AB This paper describes the efforts of the Electrochemistry Group of the Institute of Physics and Chemistry/USP to develop electrode materials for water electrolyzers and components for phosphoric acid **fuel cells**. In the last few years, several fundamental studies have been carried out in the electrocatalysis of water electrolysis reactions, particularly on hydrogen evolution, which allowed the development of materials with lower overpotentials **compared** with those of conventional **cathodes**. In the phosphoric acid **fuel cell area**, substantial progress has been made in the development of teflon-bonded gas diffusion **electrodes**, bipolar **separator** plates, and electrolyte-containing matrices. These components have been tested in 50 W and 200 W phosphoric acid **fuel cell** modules. (Author abstract) 6 Refs.  
CC 702 Electric Batteries & Fuel Cells; 525 Energy Management; 804 Chemical Products  
CT \***FUEL CELLS**: Electrodes; PHOSPHORIC ACID; ENERGY STORAGE: Brazil; HYDROGEN: Electrolysis  
ST HYDROGEN STORAGE; PHOSPHORIC ACID **FUEL CELLS**; BIPOLAR SEPARATOR PLATES; CURRENT DENSITY; TEFLON BONDED GAS DIFFUSION ELECTRODES

=> d 195 1-14 all

L95 ANSWER 1 OF 14 COMPENDEX COPYRIGHT 2002 EEI *no*  
AN 2001(45):6610 COMPENDEX  
TI Fabrication and evaluation of electrode supported planar SOFC III. Stack performance.  
AU Murata, K. (Tamano Technology Center Mitsui Eng. and Shipbldg. Co., Ltd., Okayama 706-0014, Japan); Shimotsu, M.  
SO Electrochemistry v 69 n 8 August 2001 2001.p 587-591  
CODEN: EECTFA ISSN: 1344-3542  
PY 2001  
DT Journal  
TC Experimental  
LA English  
AB A fuel-**electrode**-supported planar cell with an effective **electrode area** of 150 cm<sup>2</sup> was developed. A three-cell stack was built with ceramic gas **separators** with an electric resistance lower than 5 m  $\Omega$ . An electric power generation test was carried out at 1000 deg C with hydrogen gas and air which were fed to the cells in series. The stack attained a maximum output power of 106 W at a fuel utilization of 70%. 11 Refs.  
CC 702.2 Fuel Cells; 701.1 Electricity: Basic Concepts and Phenomena; 522 Gas Fuels; 804 Chemical Products Generally  
CT \*Solid oxide **fuel cells**; Electrochemical

electrodes; Hydrogen fuels; Thin films; Scanning electron microscopy; Current voltage characteristics; Electric resistance  
ST Gas separators

L95 ANSWER 2 OF 14 COMPENDEX COPYRIGHT 2002 EEI  
AN 2001(31):1271 COMPENDEX  
TI An innovative technique for pore structure analysis of **fuel cell** and battery components using flow porometry.  
AU Jena, A. (Porous Materials, Inc., Ithaca, NY 14850, United States); Gupta, K.  
MT Proceedings of the 22nd International Power Sources Symposium.  
ML Manchester, United Kingdom  
SO Journal of Power Sources v 96 n 1 Jun 1 2001 2001.p 214-219  
CODEN: JPSODZ ISSN: 0378-7753  
PY 2001  
MN 58284  
DT Conference Article  
TC Experimental  
LA English  
AB Some of the porous sheet materials used in **fuel cells** and batteries hardly permit gas flow through the thickness of the sheet, although flow parallel to the sheet is appreciable. Determination of the porosity of such materials is not possible by the available techniques. A novel technique based on flow porometry is reported. This technique can measure the pore structure of such porous sheets. A composite porous sheet material containing one of the **electrodes** and the **separator** in two layers was investigated. The largest pore **diameter**, the mean flow pore **diameter** and the pore **size** distributions were measured. The pore structures of both layers were identified. \$CPY 2001 Elsevier Science B.V. 3 Refs.  
CC 702.2 Fuel Cells; 631.1 Fluid Flow (General); 931.2 Physical Properties of Gases, Liquids and Solids; 704.1 Electric Components; 714.1 Electron Tubes  
CT \***Fuel cells**; Capillary flow; Porous materials; Electrodes; Porosity; Pore size  
ST Capillary flow porometry

L95 ANSWER 3 OF 14 COMPENDEX COPYRIGHT 2002 EEI  
AN 2000(49):7089 COMPENDEX  
TI Development of metallic substrate supported planar solid oxide **fuel cells** fabricated by atmospheric plasma spraying.  
AU Takenoiri, Shunji (Fuji Electric Corporate Research and Development, Ltd, Yokosuka City, Jpn); Kadokawa, Naruaki; Koseki, Kazuo  
SO Journal of Thermal Spray Technology v 9 n 3 Sep 2000.p 360-363  
CODEN: JTTEE5 ISSN: 1059-9630  
PY 2000  
DT Journal  
TC Experimental  
LA English  
AB A planar solid oxide **fu l cell** (SOFC) consisting

of a cell supported with a porous metallic substrate and a metallic separator has been developed. In the fabrication of the cell, anodes and electrolytes were formed on sintered Ni-felt substrates using flame spraying (FS) and atmospheric plasma spraying (APS), respectively. The APS is also applied to form (LaSr)MnO<sub>3</sub> protective coatings on the metallic separators. With these metallic cells and **separators**, a 3 kW-class stack, which consisted of 30 cells (15-cell block multiplied by 2) was constructed and operated. The active **electrode area** of the cell was 600 cm<sup>2</sup>. The stack generated 3.3 kW at 970 degree C when the current density was 0.3 A cm<sup>-2</sup> and the fuel utilization 50%. It did not show any degradation for the initial 2100 h, but a few cells in the lower 15-cell block became unstable after 2100 h. On the other hand, the upper 15-cell block was stably operated for 3200 h. (Author abstract) 4 Refs.

CC 932.3 Plasma Physics; 813.1 Coating Techniques; 702.2 Fuel Cells; 802.1 Chemical Plants and Equipment; 817.2 Plastics Applications; 714.1 Electron Tubes

CT \*Plasma spraying; Separators; Substrates; Flame spraying; Porous materials; Anodes; Electrolytes; Protective coatings; **Fuel cells**

ST Metallic substrates; Solid oxide **fuel cells** (SOFC)

ET Ni; F\*S; FS; F cp; cp; S cp; La\*Mn\*O\*Sr; La sy 4; sy 4; Mn sy 4; O sy 4; Sr sy 4; (LaSr)MnO<sub>3</sub>; La cp; Sr cp; Mn cp; O cp; C

L95 ANSWER 4 OF 14 COMPENDEX COPYRIGHT 2002 EEI

AN 2000(49):6952 COMPENDEX

TI Simulation of influences of layer thicknesses in an alkaline **fuel cell**.

AU Jo, J.-H. (Hanyang Univ, Seoul, South Korea); Moon, S.-K.; Yi, S.-C.

SO Journal of Applied Electrochemistry v 30 n 9 Sep 2000.p 1023-1031

CODEN: JAEI BJ ISSN: 0021-891X

PY 2000

DT Journal

TC Theoretical; Experimental

LA English

AB A computational simulation was conducted by using a one-dimensional isothermal model for an alkaline **fuel cell** (AFC) single cell to investigate influences of the thicknesses of the separator, catalyst layer, and gas-diffusion layer in an AFC. The cell polarizations were predicted at various thicknesses and their influences were also analyzed. Thickening the **separator** layer decreased the limiting current density and increased the slope of the ohmic polarization **region**. Investigation on the thickness of the **anode** catalyst layer showed that the optimum thickness varied between 0.04-0.15 mm according to the cell voltage. The thickness of the cathode catalyst layer significantly influenced the cell performance. Also, a limitation of thickness effect in the cathode catalyst layer was observed. This limitation was considered to be caused by the mass transfer resistance of the electrolyte. (Author abstract) 20 Refs.

- CC 702.2 Fuel Cells; 803 Chemical Agents; 804 Chemical Products Generally; 931.2 Physical Properties of Gases, Liquids and Solids; 723.5 Computer Applications; 701.1 Electricity: Basic Concepts and Phenomena
- CT \*Fuel cells; Diffusion in gases; Computer simulation; Current density; Cathodes; Electrolytes; Mass transfer; Catalysts
- ST Alkaline fuel cells (AFC); Isothermal models
- L95 ANSWER 5 OF 14 COMPENDEX COPYRIGHT 2002 EEI *no*
- AN 1998(26).353 COMPENDEX
- TI Investigations of SOFC interconnect/cathode interface by EDS analysis.
- AU Bernik, S. ('Jozef Stefan' Inst, Ljubljana, Slovenia); Hrovat, M.; Holc, J.; Kolar, D.
- SO Journal of Computer-Assisted Microscopy v 9 n 1 Mar 1998.p 61-62  
CODEN: JCMIEX ISSN: 1040-7286
- PY 1998
- DT Journal
- TC Experimental
- LA English
- AB The interactions between La<sub>0.7</sub>Ca<sub>0.3</sub>Cr<sub>0.98</sub>O<sub>3</sub> (interconnect, LCC) and LaMnO<sub>3</sub> (cathode, LM) were studied. Changes in the density of the interface region was related to the diffusion processes. The diffusivity of La was insignificant, while the diffusion of Cr from LCC into LM and diffusion of Ca in the opposite direction were similar. The La<sub>1</sub> minus xCa<sub>x</sub>MnO<sub>3</sub> minus delta (x less than equivalent to 0.3) and white precipitates of La<sub>2</sub>O<sub>3</sub> phase formed as a consequence of Ca substitution for La in LaMnO<sub>3</sub>. As a result, highly porous regions in the central area of diffusion couples were present. The formation of such regions in SOFC influenced the mechanical stability of the interface interconnect/cathode. 3 Refs.
- CC 931.2 Physical Properties of Gases, Liquids and Solids; 702.2 Fuel Cells; 704.1 Electric Components; 804.2 Inorganic Components; 801 Chemistry
- CT \*Interfaces (materials); Cathodes; Diffusion in solids; Lanthanum compounds; Porosity; Density (specific gravity); Spectroscopic analysis; Fuel cells
- ST Solid oxide fuels cells (SOFC); Energy dispersive spectroscopy (EDS); Mechanical stability
- ET Ca\*Cr\*La\*O; Ca sy 4; sy 4; Cr sy 4; La sy 4; O sy 4; La<sub>0.7</sub>Ca<sub>0.3</sub>Cr<sub>0.98</sub>O<sub>3</sub>; La cp; cp; Ca cp; Cr cp; O cp; La\*Mn\*O; La sy 3; sy 3; Mn sy 3; O sy 3; LaMnO<sub>3</sub>; Mn cp; La; Cr; Ca; La<sub>1</sub>; Ca\*Mn\*O; Ca sy 3; CaMnO<sub>3</sub>m; La\*O; La<sub>2</sub>O<sub>3</sub>
- L95 ANSWER 6 OF 14 COMPENDEX COPYRIGHT 2002 EEI *no*
- AN 1995(22).980 COMPENDEX
- TI Synthesis of perovskite-type compounds by drip pyrolysis.
- AU Gordes, P. (Research and Development Div, Lyngby, Den); Christiansen, N.; Jensen, E.J.; Villadsen, J.
- SO Journal of Materials Science v 30 n 4 Feb 15 1995.p 1053-1058



CODEN: JMTSAS ISSN: 0022-2461

- PY 1995  
DT Journal  
TC Experimental  
LA English  
AB Lanthanum-transition metal mixed oxides, with the general formula  $\text{La}_1 \text{ minus } x\text{MxBO}_3$ , have been prepared, wherein M stands for Ca and Sr, and B stands for one or more transition metals selected from the group consisting of Cr, Mn, Fe, Co and Ni, where 0 less than equivalent to multiplied by less than equivalent to 0.50. A drip pyrolysis method has been developed to synthesize the mixed oxides at low temperature (550 degree C). As combustion fuel, glucose was added to the aqueous solution of metal salts. The prepared compounds have perovskite structures. This paper examines the possibilities of finding a simple and large scale procedure in order to produce a long list of perovskites necessary for **fuel cell** materials (air **electrode** and **interconnect**) and catalysts for oxidation catalysis. X-ray diffraction (XRD) analysis, scanning electron microscope (SEM) measurements and determination of specific surface **area**, carbon content and particle size distribution have been carried out on the obtained perovskite powders. (Author abstract) 30 Refs.
- CC 804.2 Inorganic Components; 802.2 Chemical Reactions; 531 Metallurgy and Metallography; 804.2 Inorganic Components; 801.1 Chemistry (General); 803 Chemical Agents
- CT \*Perovskite; Scanning electron microscopy; Transition metals; Oxides; Solutions; Catalysts; Catalysis; X ray diffraction; Synthesis (chemical); Pyrolysis
- ST Drip pyrolysis; Metal salts; Perovskite structure; Silicon oxide electrolyte **fuel cells**
- ET  $\text{La}_1$  ; Ca; Sr; B; Cr; Mn; Fe; Co; Ni; C
- L95 ANSWER 7 OF 14 COMPENDEX COPYRIGHT 2002 EEI  
AN 1994(39):422 COMPENDEX  
TI Combining science and practice in the danish 'DK-SOFC' program.  
AU Knudsen, Per (Riso Natl Lab, Roskilde, Den); Bagger, Carsten; Mogensen, Mogens  
SO Journal of Power Sources v 49 n 1-3 Apr 1994.p 291-298  
CODEN: JPSODZ ISSN: 0378-7753  
PY 1994  
DT Journal  
TC General Review  
LA English  
AB A three-year solid oxide **fuel cells** (SOFC) development program completed in 1992 has produced 10 cm<sup>2</sup> cells with **area**-specific resistances in the range 0.25 to 0.40 Omega cm<sup>2</sup> at 1000 degree C. **Cathode** and **interconnect** materials were produced in the program. Sintering of electrodes, electrolyte and **interconnect** was done in air at 1300 degree C. Tests with small stacks yielded promising results. Electrochemical investigations have contributed to the understanding of the electrode processes and their kinetics. (Author

abstract) 10 Refs.

CC 702.2 Fuel Cells; 537.1 Heat Treatment Processes; 801.4.1  
Electrochemistry; 802.2 Chemical Reactions; 525.2 Energy  
Conservation; 901.3 Engineering Research  
CT \*Fuel cells; Cathodes; Sintering; Electrolytes;  
Electrochemistry; Reaction kinetics; Energy conservation;  
Engineering research; Oxides  
ST Solid oxide fuel cell; Interconnect materials;  
Pollutant; Stack technology; Clean energy technology  
ET C

L95 ANSWER 8 OF 14 COMPENDEX COPYRIGHT 2002 EEI

AN 1992(30):31780 COMPENDEX DN 920333227

TI Mathematical model of a hydrogen/oxygen alkaline fuel  
cell.

AU Kimble, Michael C. (Texas A&M Univ, College Station, TX, USA);  
White, Ralph E.

SO J Electrochem Soc v 138 n 11 Nov 1991 p 3370-3382

CODEN: JESOAN ISSN: 0013-4651

PY 1991

DT Journal

TC Bibliography; Theoretical


LA English


AB A mathematical model of a hydrogen/oxygen alkaline fuel  
cell is presented that can be used to predict polarization  
behavior under various potential loads. The model describes the  
phenomena occurring in the solid, liquid, and gaseous phases of the  
anode, separator, and cathode  
regions, assuming a macrohomogeneous, three-phase porous  
electrode structure. The model calculates the spatial  
variation of the partial pressures of oxygen, hydrogen, and water  
vapor, dissolved oxygen and hydrogen concentrations, electrolyte  
concentration, and the solid- and solution-phase potential drops. By  
developing a complete model of the alkaline fuel  
cell, the interaction of the various transport and kinetic  
resistances can be more accurately investigated under conditions  
that simulate actual fuel cells. The model  
predicts that the solution-phase diffusional resistance of dissolved  
oxygen is a major limitation to achieving high performance at low  
cell potentials, while the ohmic drop in the solid electrodes  
contributes the most resistance at high cell potentials. Other  
limitations to achieving high power densities are indicated, and  
methods to increase the maximum attainable power density are  
suggested. These performance indications can help future research and  
the design of alkaline fuel cells. (Author  
abstract) 58 Refs.

CC 702 Electric Batteries & Fuel Cells; 802 Chemical Apparatus &  
Plants; 804 Chemical Products; 921 Applied Mathematics; 931 Applied  
Physics

CT \*FUEL CELLS: Mathematical Models;  
GASES: Diffusion; OXYGEN: Chemical Reactions; HYDROGEN: Chemical  
Reactions


## ST ALKALINE FUEL CELLS

L95 ANSWER 9 OF 14 COMPENDEX COPYRIGHT 2002 EEI   
AN 1990(9):101998 COMPENDEX DN 9009104543  
TI Development of MCFC (molten carbonate fuel cell)  
of large area electrode.  
AU Zaima, Nobuyuki (Fuel Cell Development Dep); Kakihara, Toshiaki;  
Morita, Tetsuyuki; Matsuyama, Toshiya; Suzuki, Akira  
SO IHI Eng Rev (Engl Ed) v 23 n 2 Apr 1990 p 37-43  
CODEN: IHERA6 ISSN: 0018-9820.  
PY 1990  
DT Journal  
TC Application; Theoretical  
LA English  
AB MCFC shows a high efficiency of energy conversion for power  
generation. IHI has been making much effort to enlarge electrode  
area, considering it as one of the most important technologies for  
commercialization of MCFC. In recent years, IHI has accomplished the  
power generation of MCFC stacks of the largest electrode  
area in the world. Since 1987, under the support of NEDO, IHI  
has been developing the MCFC of the large size rectangular  
electrode. With the fabrication technique both of the large  
electrode and of large separator made of thin  
metal sheet, a cell with a 1 m<sup>2</sup> electrode area  
was manufactured and power generation was achieved with 10 kW class  
stack. This stack generated 9.5 kW and was operated 2,250 hours. In  
this report, the MCFC stack of large electrode area was  
mentioned. (Author abstract) 3 Refs.  
CC 702 Electric Batteries & Fuel Cells; 714 Electronic Components; 615  
Thermoelectric & Other Power Generators  
CT \*FUEL CELLS: Efficiency; ELECTRIC POWER  
GENERATION; ELECTRODES: Performance  
ST LARGE AREA ELECTRODE; MCFC (MOLTEN CARBONATE FUEL  
CELL)

L95 ANSWER 10 OF 14 COMPENDEX COPYRIGHT 2002 EEI   
AN 1987(7):113653 COMPENDEX  
TI ALUMINIUM-LITHIUM/IRON SULPHIDE IMMOBILISED SALT CELL SYSTEM.  
AU Pearce, L.J. (Admiralty Research Establishment, Poole, Engl); Birt,  
D.C.P.  
MT Power Sources 10: Research and Development in Non-Mechanical  
Electrical Power Sources, Proceedings of the 14th International  
Power Sources Symposium.  
ML Brighton, Engl  
MD 17 Sep 1984-20 Sep 1984  
SO Publ by Paul Press Ltd, London, Engl p 87-99  
ISBN: 0-12-689160-5  
PY 1985  
MN 09568  
DT Conference Article  
LA English  
AB The Admiralty Research Establishment's R and D programme to

determine the feasibility of using aluminium-lithium/iron sulphide molten salt secondary batteries for certain defence applications includes the development of a 12V 100Ah battery and a 1.2V 1000Ah cell demonstrator unit. These are both based on an immobilised salt cell system researched and developed at ARE, capable of greater than 1000 deep cycles at high utilisation; they have a design target of 100Wh Kg minus 1 at the 5h rate. Unique features include immobilisation of the molten electrolyte salt by high surface **area** porous powders within the cell structure and **electrodes** fabricated with sufficient porosity to accommodate materials transferred between **electrodes** during cycling. Forces creating **electrode** expansion and **separator** disintegration are thereby eliminated and material constructional problems eased. The basic concepts and factors limiting the performance of the immobilised salt cell system are discussed and data presented on the characteristics of 28cm<sup>2</sup> and 280cm<sup>2</sup> plate area units illustrating the high cycle and utilisation and achievable over a wide range of power densities. (Author abstract) 6 refs.

CC 702 Electric Batteries & Fuel Cells; 804 Chemical Products; 803 Chemical Agents & Basic Industrial Chemicals; 505 Mines & Mining, Nonmetallic  
 CT \*ELECTRIC BATTERIES, SECONDARY:Materials; **FUEL CELLS**; ALUMINUM COMPOUNDS:Applications; SULFUR COMPOUNDS:Applications; ELECTROLYTES; SALTS:Applications  
 ST ALUMINUM-LITHIUM/IRON SULFIDE; SALT CELL SYSTEM; MOLTEN SALT SECONDARY BATTERIES; CELL CHEMISTRY AND ELECTROCHEMISTRY; PERFORMANCE CHARACTERISTICS OF CELLS; FIRST AND SECONDARY GENERATION CELLS  
 ET D; V


L95 ANSWER 11 OF 14 COMPENDEX COPYRIGHT 2002 EEI   
 AN 1987(5) 77662 COMPENDEX DN 870546776; \*8748510  
 TI FLOODED-STARVED DESIGN FOR NICKEL-CADMIUM CELLS.  
 AU Thaller, Lawrence H. (NASA, Lewis Research Cent, Cleveland, OH, USA)  
 SO J Power Sources v 18 n 2-3 Aug-Sep 1986, Proc of the 1985 NASA/Goddard Space Flight Cent Battery Workshop, Greenbelt, MD, USA, Nov 19-21 1985 p 161-167  
 CODEN: JPSODZ ISSN: 0378-7753

PY 1985  
 DT Journal  
 TC General Review; Experimental  
 LA English


AB It is suggested that some of the design technology used in alkaline **fuel cells** be applied to the design of nickel-cadmium aerospace cells. In particular, the use of an electrolyte reservoir coupled with appropriate pore **size** engineering of the **electrodes** and **separator** should result in cells of superior performance as well as increased tolerance to manufacturing variations. (Author abstract) 2 refs.  
 CC 702 Electric Batteries & Fuel Cells; 655 Spacecraft; 704 Electric Components & Equipment; 802 Chemical Apparatus & Plants; 931 Applied

## Physics

CT \***FUEL CELLS**:Design; SPACECRAFT:Power Supply;  
 SEPARATORS:Physical Properties; ELECTROLYTES; ELECTRODES  
 ST FLOODED-STARVED DESIGN; NICKEL-CADMIUM CELLS; AEROSPACE CELLS

L95 ANSWER 12 OF 14 COMPENDEX COPYRIGHT 2002 EEI   
 AN 1985(10):151604 COMPENDEX  
 TI ELECTROLYTE MANAGEMENT IN POROUS BATTERY COMPONENTS-STATIC MEASUREMENTS.  
 AU Abbey, Kathleen M. (NASA, Lewis Research Cent, Cleveland, OH, USA); Britton, Doris L.  
 MT Proceedings of the Symposium on Porous Electrodes: Theory and Practice.  
 MO Electrochemical Soc, Energy Technology Group, Pennington, NJ, USA; Electrochemical Soc, Battery Div, Pennington, NJ, USA  
 ML Detroit, MI, USA  
 MD 17 Oct 1982-21 Oct 1982  
 SO v 84-8.Publ by Electrochemical Soc Inc, Pennington, NJ, USA p 209-233 PESODO  
 PY 1984  
 MN 05715  
 DT Conference Article  
 LA English  
 AB The interaction between the porous hydrogen and nickel electrodes and microporous separator with respect to electrolyte management in nickel/hydrogen cells has been investigated.The distribution of electrolyte among the components has been measured and correlated with the pore **size** distributions.Total void volume, and resistance of a variety of **electrodes** and **separators**.Calculations are used to show the effects of systematically varying these properties.11 refs.

CC 702 Electric Batteries & Fuel Cells; 803 Chemical Agents & Basic Industrial Chemicals; 804 Chemical Products  
 CT \*ELECTROLYTES; ELECTRIC BATTERIES; **FUEL CELLS**;  
 ELECTRODES, ELECTROCHEMICAL  
 ST PORE SIZE DISTRIBUTION; TOTAL VOID VOLUME; ELECTRODE RESISTANCE; MICROPOROUS SEPARATOR; NICKEL-HYDROGEN CELL

L95 ANSWER 13 OF 14 COMPENDEX COPYRIGHT 2002 EEI   
 AN 1983(3):29862 COMPENDEX DN \*8338523; 830318221  
 TI PORE SIZE ENGINEERING APPLIED TO STARVED ELECTROCHEMICAL CELLS AND BATTERIES.  
 AU Abbey, Kathleen M. (NASA, Lewis Res Cent, Cleveland, Ohio, USA); Thaller, Lawrence H.  
 SO NASA Tech Memo 82893 1982 15p  
 CODEN: NATMA4 ISSN: 0499-9320  
 PY 1982  
 LA English  
 AB To maximize performance in starved, multiplate cells, the cell design should rely on techniques which widen the volume tolerance characteristics.These involve engineering capillary pressure differences between the components of an electrochemical cell and

using these forces to promote redistribution of electrolyte to the desired optimum values. This can be implemented in practice by prescribing pore **size** distributions for porous back-up plates, reservoirs, and **electrodes**. In addition, electrolyte volume management can be controlled by incorporating different pore **size** distributions into the **separator**. In a nickel/hydrogen cell, the **separator** must contain pores similar in **size** to the small pores of both the nickel and hydrogen **electrodes** in order to maintain an optimum conductive path for the electrolyte. 18 refs.

CC 702 Electric Batteries & Fuel Cells

CT \*FUEL CELLS; ELECTRIC BATTERIES

L95 ANSWER 14 OF 14 COMPENDEX COPYRIGHT 2002 EEI 

AN 1981(7):5129 COMPENDEX DN 810757115

TI IMPROVED FCG-1 CELL TECHNOLOGY.

AU Anon (United Technol Corp, South Windsor, Conn)

SO Electr Power Res Inst Rep EPRI EM n 1566 Oct 1980 var pagings  
CODEN: EPEMD6

PY 1980

LA English

AB Research activities are reported, the purpose of which was to demonstrate **fuel cell** performance in the ribbed-substrate cell configuration consistent with that projected for a commercial power plant. Tests were conducted on subscale cells and on two 20-cell stacks of 4.8-Mw demonstrator-size cell components. These tests evaluated cell-stack materials, processes, components, and assembly configurations. The program activities comprised two tasks. The first task was to conduct a component development effort to introduce improvements in 3.7-ft<sup>2</sup>, ribbed-substrate acid-cell repeating parts which represented advances in performance, function, life, and lower cost for application in higher pressure and temperature power plants. Specific **areas** of change were the **electrode** substrate, catalyst, matrix, seals, **separator** plates, and coolers. In most cases, advances were developed and translated into full-**size** repeating parts for tests in 3.7-ft<sup>2</sup>, 20-cell stacks. Significant accomplishments were the successful 2800-hour demonstration of a subscale cell with a GSB-11 catalyst operating at 120 psia and 400 deg F. The objective of the second task was to evaluate full-size, ribbed-substrate stack components incorporating more stable materials at increased pressure (93 psia) and temperature (405 deg F) conditions. Two 20-cell stacks with a 3.7-ft<sup>2</sup>, ribbed-substrate cell configuration were tested.

CC 702 Electric Batteries & Fuel Cells

CT \*FUEL CELLS:Testing

ET F

=> file aerospace

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L96 ANSWER 1 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
 AN 97:022132 AEROSPACE  
 DN N96-30299  
 TI Development of solid oxide **fuel cell** technology  
 AU KANG, DAE KAB; KIM, SUN JAE; JUNG, CHOONG HWAN; KIM, KYUNG HOH;  
 PARK, JI YUN; OH, SUK JIN  
 CS Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).  
 CSS NASA; Korea, Republic of  
 SO (Jan 1995). Korea, Republic of. Avail: CASI HC A08/MF A02.  
 Report No.: KAERI-RR-1428-94; DE96-614034; NIPS-96-56651.  
 CY Korea, Republic of  
 DT Report  
 LA Korean  
 AB Solid Oxide **Fuel Cell** (SOFC) technologies that  
 use zirconium oxide as the electrolyte material were studied in this  
 present report. SOFC exhibits a very high power generation  
 efficiency of over 50 percent, and does not discharge pollution  
 materials such as dusts, sulfur dioxide, and nitrogen oxide.  
 Zirconia, Ni/YSZ (yttria stabilized zirconia), and La-Sr-Mn-Oxide  
 materials were developed for the electrolyte material, for the  
 anode, and for the cathode, respectively. After making thin  
 zirconia plate using tape casting process, anode and cathode powders  
 were screen printed on the zirconia plate for fabricating unit  
 cells. A test system composed of a vertical tube furnace, digital  
 multimeter, DC current supplier, and measuring circuit was  
 constructed for testing the unit cell performance. This system was  
 controlled by a home-made computer program. Founded on this unit  
 cell technology and system, a multi-stack SOFC system was studied.  
 This system was composed of 10 unit cells each of them had an  
**electrode** area of 40 x 40 mm. Based on this system design,  
 large and thin zirconia plates of 70 x 70 mm in **area** was  
 fabricated for the electrolyte. Different from in the unit cell  
 system, **interconnectors** are needed in the multi-stack  
 system for connecting unit cells electrically. For this  
 interconnectors, Inconel 750 alloy was selected, sliced into wafers,  
 machined, surface finished, and then Pt-plated. (AUTHOR; Author(DOE))  
 CC 44 Energy Production and Conversion  
 CT \*SOLID ELECTROLYTES; \*SOLID OXIDE **FUEL CELLS**;  
 \*YTTRIA-STABILIZED ZIRCONIA; \*ZIRCONIUM OXIDES; ANODES; CATHODES;  
 COMPUTER PROGRAMS; CONNECTORS; ENERGY TECHNOLOGY; INCONEL  
 (TRADEMARK); PLATINUM; POLLUTION CONTROL; POWDER (PARTICLES);  
 SURFACE FINISHING; THIN PLATES; WAFERS

L96 ANSWER 2 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
 AN 94:038010 AEROSPACE  
 DN N95-23573

TI Electrochemical studies of perovskite mixed conductors  
AU BROSHA, E. L.; CHUNG, B. W.; GARZON, F. H.  
CS Los Alamos National Lab., NM.  
CSS DOE; United States  
SO (1994). United States. Presented at the 1994 Fall Meeting of the Materials Research Society (MRS), Boston, MA, 28 Nov. - 2 Dec. 1994; Avail: CASI HC A02/MF A01. Contract No.: W-7405-ENG-36. Report No.: DE95-003704; LA-UR-94-3930; CONF-941144-15.  
CY United States  
DT Conference; Journal  
LA English  
AB Research into the growth of high-quality single crystal thin films of high transition temperature ( $T_c$ ) superconductors have stimulated interest in other perovskite metal oxides with a variety of physical properties. Thin films of perovskite materials are among the major focal research **areas** for optical, sensor, electronic, and superconducting applications. Two lanthanum-based oxygen/electronic conducting perovskite oxides of particular interest for high temperature **fuel cell electrodes** and **interconnects** and for other electrochemical applications such as oxygen separation devices are  $\text{La}(1-x)\text{Sr}(x)\text{MnO}(3-y)$  and  $\text{La}(1-x)\text{Sr}(x)\text{CoO}(3-y)$ . The La-based perovskites are valuable for these technologies because they reduce interfacial resistances by eliminating the need for a three phase contact area (gas, metal electrode, electrolyte). In addition, these oxides may also serve a valuable role as novel catalysts or catalytic supports; however, little is known about what catalytic properties they may possess. Fundamental study of the electrochemical, diffusional oxygen transport, and surface catalytic properties of these materials can be greatly simplified if the complications associated with the presence of grain boundaries and multiple crystallite orientations can be avoided. Therefore, single crystals of these La-based perovskites become highly desirable. In this work, the authors report the structural and electrical properties of highly oriented thin films of  $\text{La}(0.84)\text{Sr}(0.16)\text{MnO}_3$  and  $\text{La}(0.8)\text{Sr}(0.2)\text{CoO}_3$  grown on single crystal Y-ZrO<sub>2</sub> substrates. In addition, the authors have demonstrated growing, in situ, epitaxial multilayer perovskite/fluorite/perovskite configurations for fundamental **fuel cell** modeling. (DOE; DOE)  
CC 25 Inorganic and Physical Chemistry  
CT \*CONDUCTORS; \*ELECTRODES; \*ELECTROLYTES; \***FUEL CELLS**; \*HIGH TEMPERATURE; \*HIGH TEMPERATURE SUPERCONDUCTORS; \*METAL OXIDES; \*OPTICAL MEASURING INSTRUMENTS; \*PEROVSKITES; \*SINGLE CRYSTALS; \*SUPERCONDUCTIVITY; \*THIN FILMS; \*TRANSITION TEMPERATURE; CATALYSTS; CRYSTALLITES; ELECTRICAL PROPERTIES; GRAIN BOUNDARIES; SURFACE PROPERTIES; TRANSPORT PROPERTIES  
L96 ANSWER 3 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
AN 94:006382 AEROSPACE  
DN A94-31853  
TI Advanced separator study for nickel-hydrogen batteries



AU Nowlin, G.; Harvey, T. (Eagle-Picher Industries, Inc., Joplin, MO)  
SO IN:AIAA Intersociety Energy Conversion Engineering Conference, 29th,  
Monterey, CA, Aug. 7-11, 1994, Technical Papers. Pt. 1 (A94-31838  
10-44), Washington, DC, American Institute of Aeronautics and  
Astronautics, 1994, p. 86-92, (1994) pp. 86-92. American Institute  
of Aeronautics and Astronautics. Available from: Aeroplus Dispatch.  
Report No.: AIAA-Paper-94-3966.

CY United States  
DT Conference  
LA English  
AB Results are presented of test of materials chosen as potential  
alternatives to asbestos as **electrode separator**  
for nickel-hydrogen batteries. Parameters considered included  
chemical compatibility, oxidation resistance, wettability,  
electrolyte retention, bubble pressure, pore **size**,  
electrical resistivity, cost, and availability. Of all the  
alternative materials tested (which include nonwoven polyolefin  
paper, bonded sulfone/polyethylene felt, point-bonded polyphenylene  
sulfide, polyethylene paper, nonwoven polyethylene felt,  
polyethylene gas barrier membrane, polysulfone film, spun-bonded  
polypropylene, spun-laced Aramid fiber, and polyester fiber),  
several exhibited suitable performance when **compared** to  
either asbestos or zirconium oxide.

CC 33 Electronics and Electrical Engineering  
CT \*NICKEL HYDROGEN BATTERIES; \*EARTH ORBITAL ENVIRONMENTS; \*SPACECRAFT  
POWER SUPPLIES; \*SOLID ELECTRODES; \*SEPARATORS; DATA BASES;  
**FUEL CELLS**

L96 ANSWER 4 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
AN 93:044388 AEROSPACE  
DN N94-26747  
TI Processing of LaCrO3 for solid oxide **fuel cell**  
applications  
AU HUEBNER, W.; NASRALLAH, M. M.; ANDERSON, H. U.  
CS Missouri Univ., Rolla, MO.  
CSS DOE; United States  
SO (1993). United States. Presented at the Joint Contractors Meeting on  
Advanced Turbine Systems, Fuel Cells and Coal-fired Heat,  
Morgantown, WV, 3-5 Aug. 1993; Avail: CASI HC A03/MF A01.  
Contract No.: DE-FG21-93MC-29224. Report No.: DE94-002981;  
DOE-MC-29224-94-C0262; CONF-930893-23.

CY United States  
DT Conference; Journal  
LA English  
AB Objectives of this project is to produce LaCrO3 for the  
**interconnect** in solid oxide **fuel cells**.  
The project is divided into three **areas**: reproducible  
powder synthesis, sintering of LaCrO3-based powders, and  
co-sintering of LaCrO3-based powders with **cathode** and  
electrolyte materials. The project has been in place for 3 months;  
construction is underway for the spray pyrolysis system and studies  
initiated on the organometallic precursor. (DOE; DOE)

CC 44 Energy Production and Conversion  
CT \*CATHODIC COATINGS; \*ELECTROLYTES; \*ELECTROLYTIC CELLS; \*  
**FUEL CELLS**; \*ORGANOMETALLIC COMPOUNDS; \*OXIDES;  
\*POWDER (PARTICLES); \*SINTERING; \*SOLID ELECTROLYTES; CALCIUM;  
CHROMIUM OXIDES; COBALT; LANTHANUM OXIDES; PYROLYSIS; SPRAYERS

L96 ANSWER 5 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
AN 90:064225 AEROSPACE  
DN N92-12120  
TI Molten carbonate **fuel cell** research  
AU SMITH, J. L.; BROWN, A. P.; KUCERA, G. H.  
CS Argonne National Lab., IL.  
CSS DOE; United States  
SO (1990). United States. Presented at the METC Contractors Review  
Meeting, Morgantown, 2-3 May 1990; Avail: CASI HC A02/MF A01.  
Contract No.: W-31-109-ENG-38. Report No.: DE90-013896;  
CONF-9005195-2.  
CY United States  
DT Conference; Journal  
LA English  
AB The emphasis of this project is to develop new electronically  
conductive ceramic materials that are chemically and polymorphically  
stable in molten carbonate **fuel cell** (MCFC)  
environments and to test these materials as MCFC components (i.e.,  
**electrodes** and **separator** sheets). this quarter,  
the electric conductivity of undoped and niobium-doped LiFeO<sub>2</sub> and  
undoped MnO was measured. Also, methods to increase the surface  
**area** of the **cathodes** is discussed. (DOE; DOE)

CC 27 Nonmetallic Materials  
CT \*CATHODES; \***FUEL CELLS**; \*IRON OXIDES; \*LITHIUM  
OXIDES; \*MAGNESIUM OXIDES; \*MOLTEN SALTS; ALUMINUM OXIDES;  
CARBONATES; ELECTRICAL RESISTIVITY; ELECTRODES; NIOBIUM

L96 ANSWER 6 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
AN 81:062407 AEROSPACE  
DN N82-33881  
TI Evaluation of natural gas molten carbonate **fuel**  
**cell** power plants  
Final Report, 1 Mar. 1980 - 1 May 1981  
AU KING, J. M.; LEVY, A. H.; VANDINE, L. L.; WERTHEIM, R. J.  
CS United Technologies Corp., South Windsor, CT.  
CSS US/Non-Government; United States  
SO (Aug 1981). United States. Refs: 0; Sponsored by Gas Research Inst.;  
HC A08/MF A01.  
Report No.: PB82-181272; FCR-3522-2; GRI-81-0038.  
CY United States  
DT Report  
LA English  
AB Three advanced molten carbonate **fuel cell** power  
plant concepts designed to provide greater quantities of high  
quality reject heat show significant advantage over both advanced  
phosphoric acid systems and conventional molten carbonate systems

for industrial cogeneration with natural gas. Cost and energy savings with the best system (internal reforming) are 20 and 15 percent respectively when **compared** to a conventional utility approach with purchased power. The other advanced systems, **anode** exhaust recycle through an adiabatic reformer and steam **separator**, also show significant savings. Technology goals and cell stack **sizes** are consistent with the objectives of other programs meeting both cost and endurance goals, all of which are important to the success of the industrial cogeneration application. (NTIS; NTIS)

CC 44 Energy Production and Conversion  
 CT \*CARBONATES; \*FUEL CELL POWER PLANTS;  
 \*INDUSTRIES; \*NATURAL GAS; \*PHOSPHORIC ACID FUEL  
 CELLS; \*RECYCLING; COGENERATION; COMPUTER PROGRAMS; COST  
 EFFECTIVENESS; ENERGY CONSERVATION; HIGH TEMPERATURE; STEAM

L96 ANSWER <sup>7</sup> OF 8 AEROSPACE COPYRIGHT 2002 CSA

AN 80:055112 AEROSPACE

DN N81-16598

TI Improved FCG-1 cell technology  
 Final Report, 1 Mar. - 31 Dec. 1979

AU BREAUULT, R. D.; CONGDON, J. V.; COYKENDALL, R. D.; LUOMA, W. L.

CS United Technologies Corp., South Windsor, CT.

CSS DOE; United States

SO (Oct 1980). United States. Sponsored in part by Electric Power  
 Research Inst.; HC A03/MF A01.  
 Contract No.: DE-AC03-76ET-11301; EPRI-PROJ--842-5. Report No.:  
 EPRI-EM-1566.

CY United States

DT Report

LA English

AB Fuel cell performance in the ribbed substrate  
 cell configuration consistent with that projected for a commercial  
 power plant is demonstrated. Tests were conducted on subscale cells  
 and on two 20 cell stacks of 4.8 MW demonstrator size cell  
 components. These tests evaluated cell stack materials, processes,  
 components, and assembly configurations. The first task was to  
 conduct a component development effort to introduce improvements in  
 3.7 square foot, ribbed substrate acid cell repeating parts which  
 represented advances in performance, function, life, and lower cost  
 for application in higher pressure and temperature power plants.  
 Specific **areas** of change were the **electrode**  
 substrate, catalyst, matrix, seals, **separator** plates, and  
 coolers. Full sized ribbed substrate stack components incorporating  
 more stable materials were evaluated at increased pressure (93 psia)  
 and temperature (405 F) conditions. Two 20 cell stacks with a 3.7  
 square feet, ribbed substrate cell configuration were tested. (NASA  
 CASI; S.F.)

CC 44 Energy Production and Conversion

CT \*CORROSION RESISTANCE; \*COST REDUCTION; \*ELECTRIC POWER PLANTS; \*  
 FUEL CELLS; \*PRESSURE EFFECTS; \*SUBSTRATES;  
 \*TEMPERATURE EFFECTS; DESIGN ANALYSIS; ELECTRODES; ELECTROLYTIC

## CELLS; PERFORMANCE TESTS

L96 ANSWER 8 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
AN 70:061439 AEROSPACE  
DN A72-14675  
TI Research on rechargeable oxygen electrodes.  
Rechargeable oxygen electrode research program for hydrogen oxygen  
**fuel cells** and metal-oxygen batteries, discussing  
KOH solutions effects  
AU GINER, J.; HOLLECK, G.; MALACHESKY, P. A. (Tyco Laboratories, Inc.,  
Waltham, Mass.)  
CSS NASA; United States  
SO (Dec 1970). United States. Refs: 11.  
Contract No.: NAS3-13234.  
CY United States  
DT Conference  
LA English  
AB A research program is described which consisted of studying the  
effects of electrode cycling in very pure KOH solutions, with and  
without controlled additions of impurities, on oxide formation,  
oxygen evolution kinetics, oxygen reduction kinetics (including  
hydrogen peroxide formation), and changes in electrode structure.  
Bright platinum, platinized platinum, and Teflon-bonded platinum  
black electrodes were studied. Three main problem **areas**  
are identified: the buildup of a refractory **anodic** layer  
on prolonged cycling, which leads to a degradation of performance;  
the dissolution and subsequent deposition of dendritic platinum in  
the **separator**, leading to short-circuiting and loss of  
electrocatalyst; and the disruptive effect of bubbling during gas  
evolution on charge. Each of these problem areas is analyzed, and  
remedial solutions are proposed. (AIAA/TIS; V.P.)  
CC 03 Auxiliary Systems  
CT \*ELECTRIC BATTERIES; \*ELECTRODES; \*HYDROGEN OXYGEN **FUEL**  
**CELLS**; \*POTASSIUM HYDROXIDES; \*RESEARCH AND DEVELOPMENT;  
CONFERENCES; PLATINUM; REACTION KINETICS

=> d 197 1-8 all

L97 ANSWER 1 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
AN 94:006516 AEROSPACE  
DN A94-31987  
TI Experimental study on AMTEC using sodium-vapor-fed cells  
AU Yamada, Akira; Tsukuda, Hiroshi; Kukuchi, Hiroshi; Hashimoto,  
Tsumotu (Mitsubishi Heavy Industries, Ltd., Nagasaki Research and  
Development Center, Japan)  
SO IN:AIAA Intersociety Energy Conversion Engineering Conference, 29th,  
Monterey, CA, Aug. 7-11, 1994, Technical Papers. Pt. 2 (A94-31838  
10-44), Washington, DC, American Institute of Aeronautics and  
Astronautics, 1994, p. 900-903, (1994) pp. 900-903. American  
Institute of Aeronautics and Astronautics. Refs: 8. Available from:  
Aeroplus Dispatch.

Report No.: AIAA-Paper-94-3902.

CY United States

DT Conference

LA English

AB In the course of fabrication of a series of alkali metal thermal-to-electric converter (AMTEC) cells using sodium vapor, it was decided that sodium-vapor-fed AMTEC cells connected in series will be needed to realize an efficient AMTEC-solid-oxide **fuel cell** plant. This paper investigates methods for obtaining leak-free connection between beta-double-prime alumina and interconnectors, together with procedures for screen printing electrodes. It was found that Nb is most suitable for **interconnector** and Ni-Cu-Ag is most suitable for the solder to connect **interconnectors** to beta-double-prime alumina. To prepare **electrodes** by screen printing, terpeneol is best for TiC powder with particle **size** of 1-2 microns, and ethanol for TiC powder with particle **size** of 0.75 micron.

CC 44 Energy Production and Conversion

CT \*SODIUM VAPOR; \*ELECTROCHEMICAL CELLS; \*ALKALI METALS; \*ENERGY CONVERSION EFFICIENCY; ELECTRIC POWER PLANTS; ALUMINUM OXIDES; TITANIUM NITRIDES; TITANIUM CARBIDES

L97 ANSWER 2 OF 8 AEROSPACE COPYRIGHT 2002 CSA

AN 91:034290 AEROSPACE

DN A92-13196

TI A mathematical model of a hydrogen/oxygen alkaline **fuel cell**

AU KIMBLE, MICHAEL C.; WHITE, RALPH E. (Texas A & M University, College Station)

CSS Department of Defense; United States

SO Electrochemical Society, Journal, (Nov 1991) Vol. 138, pp. 3370-3382. United States. Refs: 54.  
ISSN: 0013-4651

CY United States

DT Journal

LA English

AB A mathematical model of a hydrogen/oxygen alkaline **fuel cell** is presented that can be used to predict polarization behavior under various potential loads. The model describes the phenomena occurring in the solid, liquid, and gaseous phases of the **anode, separator, and cathode regions**, assuming a macrohomogeneous, three-phase porous **electrode** structure. The model calculates the spatial variation of the partial pressures of oxygen, hydrogen, and water vapor, dissolved oxygen and hydrogen concentrations, electrolyte concentration, and the solid- and solution-phase potential drops. By developing a complete model of the alkaline **fuel cell**, the interaction of the various transport and kinetic resistances can be more accurately investigated under conditions that simulate actual **fuel cells**. The model predicts that the solution-phase diffusional resistance of dissolved oxygen is a major limitation to achieving high performance at low

cell potentials, while the ohmic drop in the solid electrodes contributes the most resistance at high cell potentials. Other limitations to achieving high power densities are indicated, and methods to increase the maximum attainable power density are suggested. (AIAA/TIS; Author)

CC 44 Energy Production and Conversion

CT \*ALKALINE BATTERIES; \*ELECTRIC ENERGY STORAGE; \*HYDROGEN OXYGEN FUEL CELLS; \*MATHEMATICAL MODELS; \*POLARIZATION (CHARGE SEPARATION); BOUNDARY CONDITIONS; CELL ANODES; CELL CATHODES; WATER VAPOR

L97 ANSWER 3 OF 8 AEROSPACE COPYRIGHT 2002 CSA

AN 91:026391 AEROSPACE

DN N91-25502

TI A mathematical model of the maximum power density attainable in an alkaline hydrogen/oxygen fuel cell  
Final Report

AU KIMBLE, MICHAEL C.; WHITE, RALPH E.

CS Texas A&M Univ., College Station.

CSS NASA; United States

SO (Jun 1991). United States. Avail: CASI HC A06/MF A02.  
Contract No.: NAG3-1043. Report No.: NASA-CR-188613;  
NAS-1-26-188613.

CY United States

DT Report

LA English

AB A mathematical model of a hydrogen/oxygen alkaline fuel cell is presented that can be used to predict the polarization behavior under various power loads. The major limitations to achieving high power densities are indicated and methods to increase the maximum attainable power density are suggested. The alkaline fuel cell model describes the phenomena occurring in the solid, liquid, and gaseous phases of the anode, separator, and cathode regions based on porous electrode theory applied to three phases. Fundamental equations of chemical engineering that describe conservation of mass and charge, species transport, and kinetic phenomena are used to develop the model by treating all phases as a homogeneous continuum. (AUTHOR; Author)

CC 44 Energy Production and Conversion

CT \*ALKALINE BATTERIES; \*FUEL CELLS; \*GASES;  
\*HYDROGEN OXYGEN FUEL CELLS; \*LIQUID PHASES;  
\*MATHEMATICAL MODELS; \*SEPARATORS; \*SOLID PHASES; ANODES; CATHODES;  
CHARGE TRANSFER; CHEMICAL ENGINEERING; CONSERVATION LAWS; CONTINUITY EQUATION; MASS TRANSFER; POROSITY; POTASSIUM HYDROXIDES

L97 ANSWER 4 OF 8 AEROSPACE COPYRIGHT 2002 CSA

AN 89:025999 AEROSPACE

DN N89-28957

TI Material and fabrication challenges in the development of monolithic solid oxide fuel cells

AU BALACHANDRAN, U. (Argonne National Lab., IL.); DORRIS, S. E.

(Argonne National Lab., IL.); PICCIOLO, J. J. (Argonne National Lab., IL.); POEPPEL, R. B. (Argonne National Lab., IL.); MCPHEETERS, C. C. (Argonne National Lab., IL.); MINH, N. Q. (Allied-Signal Aerospace Co., Torrance, CA.)

CS Argonne National Lab., IL.  
CSS DOE; United States  
SO (1989). United States. Submitted for publication Sponsored in part by Gas Research Inst.; Presented at the 24th Intersociety Energy Conversion Engineering Conference, Washington, DC, 6-11 Aug. 1989; Avail: CASI HC A03/MF A01.  
Contract No.: W-31-109-ENG-38. Report No.: DE89-012422;  
CONF-890815-5.  
CY United States  
DT Conference; Journal  
LA English  
AB Monolithic solid oxide **fuel cells** (MSOFCs) are presently under development for a variety of practical applications (e.g., advanced space and aerospace power systems, electric utility power generation). The MSOFC is composed of a honeycomb of very small cells of 1 to 2 mm in **diameter**. The walls of the honeycomb are formed from thin (25 to 100 mm) ceramic layers of cell components: **cathode** (Sr-doped LaMnO3), **anode** (Ni/Y2O3-ZrO2 cermet), electrolyte (Y2O3-stabilized ZrO2), and **interconnect** (doped LaCrO3) materials. These walls form the passages for fuel and oxidant gases. The MSOFC will convert hydrogen or hydrocarbon fuels to dc power at more than 50 percent efficiency and can achieve considerably higher energy densities than many other technologies. Successful fabrication of an MSOFC depends on incorporating the materials into a self-supporting structure at a higher sintering temperature. A fabrication scheme for the MSOFC must incorporate each material such that no conditions of any fabrication step will destroy desired material characteristics of any of the component layers. Material characteristics and processing parameters must be tailored and controlled to fabricate the MSOFC with desired properties. Material properties, material requirements, and fabrication issues in the development of the MSOFC are discussed. (DOE; DOE)

CC 44 Energy Production and Conversion  
CT \*ENERGY CONVERSION EFFICIENCY; \*FABRICATION; \***FUEL CELLS**; \*MANGANESE OXIDES; \*SOLID ELECTROLYTES; \*ZIRCONIUM OXIDES; CERMETS; CHROMIUM OXIDES; ELECTRODES; HYDROCARBONS; LANTHANUM COMPOUNDS; NICKEL OXIDES

L97 ANSWER 5 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
AN 83:041820 AEROSPACE  
DN A84-30187  
TI Pore size engineering applied to the design of separators for nickel-hydrogen cells and batteries  
AU ABBEY, K. M.; BRITTON, D. L. (NASA, Lewis Research Center, Cleveland, OH)  
CS National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

CSS NASA; United States  
SO IN: IECEC '83; Proceedings of the Eighteenth Intersociety Energy Conversion Engineering Conference, Orlando, FL, August 21-26, 1983. Volume 4 (A84-30169 13-44). New York, American Institute of Chemical Engineers, 1983, p. 1552-1560., (1983). United States. Refs: 12.  
CY United States  
DT Conference  
LA English  
AB Pore size engineering in starved alkaline multiplate cells involves adopting techniques to widen the volume tolerance of individual cells. **Separators** with appropriate pore **size** distributions and wettability characteristics (capillary pressure considerations) to have wider volume tolerances and an ability to resist dimensional changes in the **electrodes** were designed. The **separators** studied for potential use in nickel-hydrogen cells consist of polymeric membranes as well as inorganic microporous mats. In addition to standard measurements, the resistance and distribution of electrolyte as a function of total cell electrolyte content were determined. New composite separators consisting of fibers, particles and/or binders deposited on Zircar cloth were developed in order to engineer the proper capillary pressure characteristics in the separator. These asymmetric separators were prepared from a variety of fibers, particles and binders. Previously announced in STAR as N83-24571(AIAA/TIS; Author)  
CC 44 Energy Production and Conversion  
CT \*ALKALINE BATTERIES; \*FUEL CELLS; \*NICKEL HYDROGEN BATTERIES; \*SIZE DISTRIBUTION; \*SYSTEMS ENGINEERING; \*WETTABILITY; BINDERS (MATERIALS); CHARGE DISTRIBUTION; ELECTROLYTES; INTERFACIAL TENSION; MEMBRANES; POLYMERIC FILMS; POROSITY; SEPARATORS

L97 ANSWER 6 OF 8 AEROSPACE COPYRIGHT 2002 CSA  
AN 83:022839 AEROSPACE  
DN N83-24571  
TI Pore size engineering applied to the design of separators for nickel-hydrogen cells and batteries  
AU ABBEY, K. M.; BRITTON, D. L.  
CS National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
CSS NASA; United States  
SO (1983). United States. Refs: 0; Proposed for presentation at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21-26 Aug. 1983; sponsored by American Inst. of Chemical Engineers, IEEE, AIAA, American Chemical Society, ANS, ASME, and SAE; HC A03/MF A01. Contract No.: RTOP-505-55-52. Report No.: NASA-TM-83386; E-1663; NAS-1-15-83386.  
CY United States  
DT Conference; Journal  
LA English  
AB Pore size engineering in starved alkaline multiplate cells involves adopting techniques to widen the volume tolerance of individual



cells. **Separators** with appropriate pore **size** distributions and wettability characteristics (capillary pressure considerations) to have wider volume tolerances and an ability to resist dimensional changes in the **electrodes** were designed. The **separators** studied for potential use in nickel-hydrogen cells consist of polymeric membranes as well as inorganic microporous mats. In addition to standard measurements, the resistance and distribution of electrolyte as a function of total cell electrolyte content were determined. New composite separators consisting of fibers, particles and/or binders deposited on Zircar cloth were developed in order to engineer the proper capillary pressure characteristics in the separator. These asymmetric separators were prepared from a variety of fibers, particles and binders. (AUTHOR; Author)

CC 25 Inorganic and Physical Chemistry

CT \*ALKALINE BATTERIES; \*FUEL CELLS; \*NICKEL HYDROGEN BATTERIES; \*SIZE DISTRIBUTION; \*SYSTEMS ENGINEERING; \*WETTABILITY; BINDERS (MATERIALS); CHARGE DISTRIBUTION; ELECTROLYTES; INTERFACIAL TENSION; MEMBRANES; POLYMERIC FILMS; POROSITY; SEPARATORS

L97 ANSWER 7 OF 8 AEROSPACE COPYRIGHT 2002 CSA

AN 82:048332 AEROSPACE

DN N83-18862

TI Electrolyte management in porous battery components. Static measurements

AU ABBEY, K. M.; BRITTON, D. L.

CS National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

CSS NASA; United States

SO (1982). United States. Refs: 0; Presented at the Autumn Ann. Meeting of the Electrochemical Society, Detroit, 17-22 Oct. 1982; HC A03/MF A01.

Contract No.: RTOP-506-55-52. Report No.: NASA-TM-83073; E-1545; NAS-1-15-83073.

CY United States

DT Conference; Journal

LA English

AB The interaction between the porous hydrogen and nickel electrodes and microporous separator with respect to electrolyte management in nickel/hydrogen cells has been investigated. The distribution of electrolyte among the components has been measured and correlated with the pore **size** distributions, total void volume, and resistance of a variety of **electrodes** and **separators**. Calculations are used to show the effects of systematically varying these properties. (AUTHOR; Author)

CC 25 Inorganic and Physical Chemistry

CT \*ELECTRODES; \*ELECTROLYTES; \*NICKEL HYDROGEN BATTERIES; \*POROSITY; \*SEPARATORS; FUEL CELLS; RESISTANCE; SIZE DISTRIBUTION; STATIC PRESSURE; ZIRCONIUM OXIDES

L97 ANSWER 8 OF 8 AEROSPACE COPYRIGHT 2002 CSA

AN 82:042334 AEROSPACE  
 DN N83-10134  
 TI Pore size engineering applied to starved electrochemical cells and batteries  
 AU ABBEY, K. M.; THALLER, L. H.  
 CS National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
 CSS NASA; United States  
 SO (1982). United States. Refs: 0; Presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles 8-13 Aug. 1982; sponsored by IEEE; HC A03/MF A01. Contract No.: RTOP-506-55-52. Report No.: NASA-TM-82893; E-1271; NAS-1-15-82893.  
 CY United States  
 DT Conference; Journal  
 LA English  
 AB To maximize performance in starved, multiplate cells, the cell design should rely on techniques which widen the volume tolerance characteristics. These involve engineering capillary pressure differences between the components of an electrochemical cell and using these forces to promote redistribution of electrolyte to the desired optimum values. This can be implemented in practice by prescribing pore **size** distributions for porous back-up plates, reservoirs, and **electrodes**. In addition, electrolyte volume management can be controlled by incorporating different pore **size** distributions into the **separator**. In a nickel/hydrogen cell, the **separator** must contain pores similar in **size** to the small pores of both the nickel and hydrogen **electrodes** in order to maintain an optimum conductive path for the electrolyte. The pore **size** distributions of all components should overlap in such a way as to prevent drying of the **separator** and/or flooding of the hydrogen **electrode**. (AUTHOR; Author)  
 CC 25 Inorganic and Physical Chemistry  
 CT \*ELECTROCHEMICAL CELLS; \*ELECTROLYTES; \*FUEL CELLS  
 ; \*NICKEL HYDROGEN BATTERIES; \*POROSITY; \*SIZE DISTRIBUTION; DESIGN ANALYSIS; ELECTRIC BATTERIES; ELECTRODES; ENERGY CONVERSION; NICKEL CADMIUM BATTERIES

=> file energy

FILE 'ENERGY' ENTERED AT 10:18:19 ON 10 OCT 2002

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FILE COVERS 1974 TO DATE.

>>> NEW CLASSIFICATION SCHEME - SEE HELP CLA <<<

=> d 198 1-13 all

L98 ANSWER 1 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE

AN 1999(3):8972 ENERGY

TI A study of a corrosion-resistant coating for a separator for a molten carbonate fuel cell.

AU Hwang, E.R.; Kang, S.G. (Hanyang Univ., Seoul (Korea, Republic of). Dept. of Materials Engineering)

SO Journal of Power Sources (1 Nov 1998) v. 76(1) p. 48-53.  
CODEN: JPSODZ ISSN: 0378-7753

DT Journal

CY Switzerland

LA English

FA AB

AB The corrosion behaviour of nickel and copper coatings in the current-collector area of separators and a Ni/Al intermetallic compound coating in the wet-seal area of separators for molten carbonate fuel cells is evaluated under immersion in molten carbonate salt. The corrosion-protection effect of nickel and copper coatings on 316L stainless steel is evaluated in an electrochemical half-cell by means of a potentiostatic polarization technique. In addition, the corrosion-protection behaviour of a nickel-coated layer in the anode current-collector area and a Ni/Al-coated layer in the wet-seal area of the separator are studied during operation of a single cell for 10 days. Nickel suffers no observable corrosive attack for up to 500 h in the anode gas atmosphere (H<sub>2</sub>/CO<sub>2</sub>). By contrast, nickel and copper exhibit less corrosion resistance than 316L stainless-steel during exposure to the cathode gas atmosphere (CO<sub>2</sub>/O<sub>2</sub>). Under a potentiostatic anodic polarization of -1.0 V (versus CO<sub>2</sub>/O<sub>2</sub>/Au), nickel-coated 316L stainless-steel displays a lower anodic current density than copper-coated and uncoated 316L stainless-steel. NiAl with a high melting point has better corrosion resistance than other Ni/Al intermetallic compounds. From single cell tests, it is found that nickel and NiAl coatings are efficient for the protection of stainless-steel in the anode area and wet-seal area, respectively. (orig.)

CC \*300503

CT ALUMINIUM ALLOYS; COPPER; CORROSION RESISTANCE; CROSS SECTIONS; INTERMETALLIC COMPOUNDS; MOLTEN CARBONATE FUEL CELLS; NICKEL; NICKEL ALLOYS; PROTECTIVE COATINGS; SCANNING ELECTRON MICROSCOPY; STAINLESS STEEL-316L

BT ALLOYS; AUSTENITIC STEELS; CHROMIUM ALLOYS; CHROMIUM STEELS; CHROMIUM-MOLYBDENUM STEELS; CHROMIUM-NICKEL STEELS; CHROMIUM-NICKEL-MOLYBDENUM STEELS; COATINGS; DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; ELECTRON MICROSCOPY; ELEMENTS; FUEL CELLS; HIGH ALLOY STEELS; HIGH-TEMPERATURE FUEL CELLS; IRON ALLOYS; IRON BASE ALLOYS; METALS; MICROSCOPY; MOLYBDENUM ALLOYS; NICKEL; STAINLESS STEELS; STEEL-CR17NI12MO3-L; STEELS; TRANSITION ELEMENTS

ET Ni; H<sub>2</sub>; C\*O; CO<sub>2</sub>; C cp; cp; O cp; Al\*Ni; Al sy 2; sy 2; Ni sy 2; NiAl; Ni cp; Al cp

L98 ANSWER 2 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE

AN 1997(17):106666 ENERGY

TI Solid oxide fuel cell separator.

*previously  
viewed*

Kotai denkaishitsugata nenryo denchiyo separeta.

AU Fujimoto, K.; Kakuta, J.; Yoshida, T. (Tonen Corp., Saitama (Japan). Research and Development Lab.)

CS Tonen Corp., Tokyo (Japan); Petroleum Energy Center, Tokyo (Japan)

PI JP 945344 14 Feb 1997 4 p.

Available from Japan Patent Information Organization of International Patent Documentation Center

AI 2 Aug 1995

DT Patent; Availability Note

CY Japan

LA Japanese

FA AB

AB The solid oxide fuel cell separator occupies large thickness among the fuel cell members. Contribution to miniaturization of the fuel cell is significant if the thin film formation is achieved. The conventional grooved separator has a larger area in contact with an electrode than a groove area; as a result, the temperature distribution is wide, and a low output is anticipated. The invention relates to the solid oxide fuel cell separator provided with many grooves at least on one side for feed gas streams, wherein the surface area in contact with one electrode is adjusted in the range of 20 to 50 % of the total electrode area. As a result, the groove structure can be made wider and the depth shallower when the same gas flow rate and the groove capacity are maintained to obtain identical cell characteristics. When the same groove width is maintained, the groove capacity becomes large and the flow rate increases without raising the differential pressure; improvement of output performance and control of temperature distribution on the surface are made easier. 1 fig., 1 tab.

IC H01M008-002

CC \*300503

CT COMPATIBILITY; CONTROL; ELECTRIC POWER; PARTITION; PLATES; PRODUCTION; SCALE DIMENSION; SOLID ELECTROLYTE FUEL CELLS; TEMPERATURE DISTRIBUTION

\*SOLID ELECTROLYTE FUEL CELLS: \*PARTITION; \*PARTITION: \*PLATES;

\*PARTITION: \*SCALE DIMENSION; \*PARTITION: \*COMPATIBILITY;

\*PRODUCTION: \*ELECTRIC POWER

BT DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; FUEL CELLS; POWER

L98 ANSWER 3 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE

AN 1996(18):126829 ENERGY

TI Fuel cell power generation system and cooling method of the fuel cell.

Nenryo denchi hatsuden setsubi to nenryo denchi no reikyaku hoho.

AU Hosaka, M.

CS Ishikawajima-Harima Heavy Industries Co. Ltd., Tokyo (Japan)

PI JP 896818 12 Apr 1996 8 p.

Available from Japan Patent Information Organization of International Patent Documentation Center

AI 26 Sep 1994

DT Patent; Availability Note

CY Japan

LA Japanese  
FA AB  
AB In the conventional high temperature fuel cell such as molten carbonate fuel cell, the heat generated during the power generation is removed by flowing a large volume of cathode gas using a blower. The cooling by the gas with a low heat capacity makes a large the temperature difference between the inlet and the outlet of the cell, so that the thermal distortion and heat cycle due to the load fluctuation are induced, resulting in shortening the life time of the cell. This invention solves the problem. In the molten carbonate fuel cell, a water spray with a droplet size which is sufficiently large for keeping the liquid state is applied to the pathway between the cathode and the separator plate during the cathode gas passage through the cathode. The water droplets sprayed in this way flow down along the cathode, inducing the Leidenfrost phenomenon on the surface of cathode and separator plate. Thus the cathode and separator plate are uniformly cooled down with a relatively low thermal transfer coefficient. As a result, the reaction temperature can be uniformly maintained from the inlet to the outlet of the fuel cell, improving the cell performance. 6 figs.

IC H01M008-002; H01M008-004; H01M008-014  
CC \*300501; 300503  
CT ANODES; CATHODES; COOLING SYSTEMS; DROPLETS; DUCTS; EQUIPMENT; MOLTEN CARBONATE FUEL CELLS; PARTITION; PLATES; POWER PLANTS; SPRAYS; WATER  
\*MOLTEN CARBONATE FUEL CELLS: \*POWER PLANTS; \*MOLTEN CARBONATE FUEL CELLS: \*COOLING SYSTEMS; \*ANODES: \*PARTITION; \*ANODES: \*PLATES; \*ANODES: \*DUCTS; \*CATHODES: \*PARTITION; \*CATHODES: \*PLATES; \*CATHODES: \*DUCTS

BT DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; ELECTRODES; ENERGY SYSTEMS; FUEL CELLS; HIGH-TEMPERATURE FUEL CELLS; HYDROGEN COMPOUNDS; OXYGEN COMPOUNDS; PARTICLES

L98 ANSWER 4 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE  
AN 1994(24):166340 ENERGY  
TI Humidifying system for fuel cell.  
Nenryo denchi no kashitsu system sochi.  
AU Hashizaki, K.  
CS Mitsubishi Heavy Industries Ltd., Tokyo (Japan)  
PI JP 6119931 28 Apr 1994 8 p.  
Available from Japan Patent Information Organization of  
International Patent Documentation Center  
AI 2 Oct 1992  
DT Patent; Availability Note  
CY Japan  
LA Japanese  
FA AB  
AB The amount of steam introduced to the conventional solid polyelectrolyte fuel cell is limited to the amount of steam corresponding to the saturated steam partial pressure at humidification temperature because the fuel hydrogen is humidified

only at the inlet to the fuel cell, and water holding of the electrolyte high molecular ion exchange film can not be maintained in the vicinity of the end of the hydrogen flowing groove due to lowered steam pressure. This invention is concerned with provision of plurally divided solid polyelectrolyte fuel cell stacks and a humidifying device equipped at the upstream of each stack for humidifying fuel hydrogen, and with a means of connecting each stack with a plural number of humidifying devices for introducing fuel hydrogen to each stack with gradual humidification. Therefore, sufficient water holding condition of the high molecular ion exchange film can be maintained throughout the total area along the hydrogen channel groove provided on the separator, and hydrogen is uniformly distributed to the electrode joint in each stack. 7 figs.

IC H01M008-004; H01M008-010

CC \*300503

CT CONCENTRATION RATIO; FUEL GAS; HUMIDIFIERS; HUMIDITY CONTROL; HYDROGEN; ION EXCHANGE; MEMBRANES; POLYMERS; SOLID ELECTROLYTE FUEL CELLS; SOLID ELECTROLYTES; STACKS; WATER VAPOR  
\*SOLID ELECTROLYTE FUEL CELLS: \*SOLID ELECTROLYTES; \*SOLID ELECTROLYTE FUEL CELLS: \*POLYMERS; \*FUEL GAS: \*HYDROGEN; \*FUEL GAS: \*HUMIDIFIERS; \*ION EXCHANGE: \*MEMBRANES; \*ION EXCHANGE: \*HUMIDITY CONTROL

BT CONTROL; DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; ELECTROLYTES; ELEMENTS; FLUIDS; FUEL CELLS; FUELS; GAS FUELS; GASES; NONMETALS; VAPORS

L98 ANSWER (5) OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE

AN 1994(24):166323 ENERGY

TI Solid electrolyte type fuel cell.

Kotai denkaishitsugata nenryo denchi.

AU Taniguchi, S.; Yasuo, K.; Ishida, N.; Akiyama, Y.; Saito, T.

CS Sanyo Electric Co. Ltd., Moriguchi, Osaka (Japan)

PI JP 696779 8 Apr 1994 7 p.

Available from Japan Patent Information Organization of International Patent Documentation Center

AI 14 Sep 1992

DT Patent; Availability Note

CY Japan

LA Japanese

FA AB

AB The solid electrolyte type fuel cell (SOFC) is made by stacking numbers of cells and separators layer by layer followed by fastening the whole cells in order to reduce the inner resistance of the cell. At some parts of the electrode where the electrode contacts with the protruding part of the separator, the diffusion of reactive gas is hindered, so that the effective power generation in the electrode surface cannot be achieved. Accordingly, the effective area is reduced in the whole electrode, resulting in the decrease in cell output. This invention solves the problem. In either or both of the fuel electrode and oxidizer electrode of the SOFC, the average porosity of the electrode part which contacts with the protruding part of the separator is increased as compared

with the porosity of the electrode part which does not contact with the protruding part of the separator. As a result, the effective surface area of whole cell is enlarged, resulting in increase of cell power output. A similar effect can be obtained by enlarging the average pore size in the electrode. 7 figs.

IC H01M008-002; H01M004-086; H01M008-012  
 CC \*300501; 250901  
 CT DIFFUSION; ELECTRIC CONTACTS; ELECTRODES; ENERGY EFFICIENCY; FUEL GAS; LAYERS; PLATES; POROSITY; ROUGHNESS; SEPARATION EQUIPMENT; SOLID ELECTROLYTE FUEL CELLS; SURFACE AREA  
 \*SOLID ELECTROLYTE FUEL CELLS: \*ELECTRODES; \*SOLID ELECTROLYTE FUEL CELLS: \*LAYERS; \*LAYERS: \*SEPARATION EQUIPMENT; \*LAYERS: \*PLATES; \*FUEL GAS: \*DIFFUSION; \*FUEL GAS: \*ENERGY EFFICIENCY  
 BT DIRECT ENERGY CONVERTERS; EFFICIENCY; ELECTRICAL EQUIPMENT; ELECTROCHEMICAL CELLS; EQUIPMENT; FLUIDS; FUEL CELLS; FUELS; GAS FUELS; GASES; SURFACE PROPERTIES

L98 ANSWER 6 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE  
 AN 1994(15):100803 ENERGY  
 TI Current status of research and development of solid oxide fuel cell.  
 Kotai denkaishitsugata nenryo denchi no kenkyu kaihatsu doko.  
 AU Kato, A. (Chubu Electric Power Co. Inc., Nagoya (Japan))  
 SO Denki Gakkai Ronbunshi, B (Transactions of the Institute of Electrical Engineers of Japan. Power and Energy) (Japan) (20 Feb 1994) v. 114(2) p. 121-124.  
 CODEN: DGRBBU ISSN: 0385-4213  
 DT Journal  
 CY Japan  
 LA Japanese  
 FA AB  
 AB Since fuel cells can obtain high generating efficiency and does not almost pollute environment, they have been expected to be an energy-saving and clean powder generating method, and their developments are undergoing in each aspect. Specially, a Solid Oxide Fuel Cell (SOFC) is still developed under a level of basic elements. Since it works at the high temperature of about 1000 degree C, it can get high efficiency in comparison to other kinds of fuel cells from a viewpoint of a composite generation that waste heat is effectively used. This paper explained kinds of fuel cells and the generating principle of SOFC, and summarily described conditions for obtaining solid electrolytes, electrodes and the interconnecting materials of SOFC. Then, the current status of research and development of SOFC in civil and overseas groups was respectively introduced. Finally, cell materials, large size of the electrode area, gas seals, the cell layers technique and the systematic technique were given as technical developing subjects, and their contents were explained. 7 refs., 5 figs., 3 tabs.

CC \*300501  
 CT ANODES; CATHODES; CONNECTORS; FORECASTING; FUEL CELLS; RESEARCH PROGRAMS; REVIEWS; SOLID ELECTROLYTES  
 \*FUEL CELLS: \*SOLID ELECTROLYTES; \*FUEL CELLS: \*ANODES; \*FUEL

CELLS: \*CATHODES; \*RESEARCH PROGRAMS: \*REVIEWS; \*RESEARCH PROGRAMS:  
\*FORECASTING

BT CONDUCTOR DEVICES; DIRECT ENERGY CONVERTERS; DOCUMENT TYPES;  
ELECTRICAL EQUIPMENT; ELECTROCHEMICAL CELLS; ELECTRODES;  
ELECTROLYTES; EQUIPMENT

ET C

L98 ANSWER 7 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE *Revised*  
AN 1994(4):24598 ENERGY

TI Interconnector for solid oxide electrolyte fuel cell.  
Kotai denkaishitsu nenryo denchiyo interconnector.

AU Mukaizawa, I. (Tonen Corp., Tokyo (Japan). Research and Development  
Center)

CS Tonen Corp., Tokyo (Japan)

PI JP 5174851-13 Jul 1993 6 p.

Available from Japan Patent Information Organization of  
International Patent Documentation Center

AI 31 Oct 1991

DT Patent; Availability Note

CY Japan

LA Japanese

FA AB

AB The fabricating process of the conventional flat plate type solid  
oxide electrolyte fuel cell can be simplified very much because it  
can be fabricated by stacking the power generating member and the  
interconnector, but it is estimated that the cell resistance  
excluding polarization resistance consists of the resistance of the  
member materials and the contact resistance half-and-half, and the  
reduction of this resistance has been a big problem. This invention  
is concerned with provision of a rugged member in the  
interconnector used for the flat plate type solid oxide electrolyte  
fuel cell on the surface which contacts the cathode, the convex  
area serving as the electrical contact area between the electrode  
and the interconnector, and the concave area forming channels for  
the fuel gas and air. The area of the interconnector which contacts  
the cathode is made larger than 30% of that of the cathode area. If  
the contact area is less than 30%, the resistance in the cathode  
surface direction increases and enough power generated by the power  
generating member of the fuel cell can not be taken out to the  
outside. 6 figs., 1 tab.

IC H01M008-002; H01M008-012

CC \*300503

CT AIR FLOW; CATHODES; CONNECTORS; ELECTRIC CONDUCTIVITY; ELECTRIC  
CONTACTS; FUEL GAS; LAYERS; PLATES; POLARIZATION; SOLID ELECTROLYTE  
FUEL CELLS; SOLID ELECTROLYTES; SURFACE PROPERTIES  
\*SOLID ELECTROLYTE FUEL CELLS: \*CONNECTORS; \*SOLID ELECTROLYTE FUEL  
CELLS: \*LAYERS; \*CATHODES: \*ELECTRIC CONTACTS; \*CATHODES: \*SURFACE  
PROPERTIES; \*POLARIZATION: \*ELECTRIC CONDUCTIVITY

BT CONDUCTOR DEVICES; DIRECT ENERGY CONVERTERS; ELECTRICAL EQUIPMENT;  
ELECTRICAL PROPERTIES; ELECTROCHEMICAL CELLS; ELECTRODES;  
ELECTROLYTES; EQUIPMENT; FLUID FLOW; FLUIDS; FUEL CELLS; FUELS; GAS  
FLOW; GAS FUELS; GASES; PHYSICAL PROPERTIES



L98 ANSWER 8 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE  
AN 1993(23):149056 ENERGY  
TI Development research on mono-block layer built solid oxide fuel  
cell.  
MOLB gata kotai denkaishitsugata neryo denchi no kaihatsu kenkyu.  
AU Hattori, M.; Esaki, Y. (The Chubu Electric Power Co. Inc., Nagoya  
(Japan))  
SO Chubu Denryoku K.K. Kenkyu Shiryo (Memoirs of the Chubu Electric  
Power Co., Ltd.) (Japan) (May 1993) (no.90) p. 63-67.  
CODEN: CDKSAD ISSN: 0387-0057  
DT Journal  
CY Japan  
LA Japanese  
FA AB  
AB This paper describes configurations, performance improvement and  
power generation test results of a mono-block layer built (MOLB)  
solid oxide fuel cell that can be expected of size reduction, mass  
production, and cost reduction. The fuel cell comprises  
electrolyte, fuel electrodes, air electrodes and interconnectors.  
Thin film supporting layers made of the same material as respective  
electrodes and in contact with the electrodes form direct and  
alternating gas flow paths. Extensive test were carried out to  
improve the performance. The tests included prevention of reduction  
in fuel electrode conductivity due to additives, optimization of  
sintering temperatures relative to NiO/YSZ ratio and fuel electrode  
resistance increase ratio, gas sealability, and measures to prevent  
cracking in cell materials. As a result, a 40-stage cell assembly  
comprising 150-mm square unit cells was manufactured and tested for  
power generation. An output of 538 W was obtained at a cell voltage  
of 0.7V. Then, a 1-kW class power generation test was given on  
three cell assemblies with the same specification, in which a  
maximum output of 1.32 kW was obtained, successfully generating the  
power continuously for about 1000 hours. 17 figs., 2 tabs.  
CC \*300501  
CT AIR; COST; CRACKS; CROSSFLOW SYSTEMS; ELECTRIC CONDUCTIVITY;  
ELECTRODES; FUEL GAS; GAS FLOW; MECHANICAL STRUCTURES;  
MINIATURIZATION; PERFORMANCE TESTING; PRODUCTIVITY; SEALS;  
SINTERING; SOLID ELECTROLYTE FUEL CELLS; SUPPORTS; TEMPERATURE  
DEPENDENCE  
\*SOLID ELECTROLYTE FUEL CELLS: \*MECHANICAL STRUCTURES; \*SOLID  
ELECTROLYTE FUEL CELLS: \*MINIATURIZATION; \*SOLID ELECTROLYTE FUEL  
CELLS: \*PRODUCTIVITY; \*SOLID ELECTROLYTE FUEL CELLS: \*COST; \*SOLID  
ELECTROLYTE FUEL CELLS: \*ELECTRODES; \*SOLID ELECTROLYTE FUEL CELLS:  
\*GAS FLOW; \*ELECTRODES: \*FUEL GAS; \*ELECTRODES: \*AIR; \*ELECTRODES:  
\*SUPPORTS; \*ELECTRODES: \*ELECTRIC CONDUCTIVITY; \*ELECTRODES:  
\*SINTERING; \*ELECTRODES: \*TEMPERATURE DEPENDENCE; \*GAS FLOW:  
\*CROSSFLOW SYSTEMS  
BT DIRECT ENERGY CONVERTERS; ELECTRICAL PROPERTIES; ELECTROCHEMICAL  
CELLS; FABRICATION; FLUID FLOW; FLUIDS; FUEL CELLS; FUELS; GAS  
FUELS; GASES; MECHANICAL STRUCTURES; PHYSICAL PROPERTIES; TESTING  
ET Ni\*O; NiO; Ni cp; cp; O cp; V

L98 ANSWER 9 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE  
AN 1992(22):166193 ENERGY  
TI Solid electrolyte fuel cell.  
Kotai denkaishitsugata nenryo denchi.  
AU Kubo, M.; Ono, M.; Hosaka, A. (Ishikawajima-Harima Heavy Industries Co. Ltd., Tokyo (Japan))  
CS Ishikawajima-Harima Heavy Industries Co. Ltd., Yokohama (Japan).  
Yokohama No.2 Works  
PI JP 4121967 22 Apr 1992 4 p.  
Available from Japan Patent Information Organization or  
International Patent Documentation Center  
AI 11 Sep 1990  
DT Patent; Availability Note  
CY Japan  
LA Japanese  
FA AB  
AB A rugged gas channel is provided on one side of each electrode of the oxygen and the fuel electrodes of the conventional solid oxide electrolyte fuel cell, but it is extremely difficult to make uneven surface for the formation of the gas channel on thin electrode plates. This invention is concerned with the solid oxide electrolyte fuel cell, wherein gas channel structural members for forming gas channels are arranged to form gas channels on each surface of the oxygen and the fuel electrodes with interposed electrolyte plates, and porous members are used for the said gas channel structural members whose microstructure is varied towards the direction of the thickness, i.e. relatively dense near the separator and comparatively rough near the electrodes. As a result, the power generating performance is improved because electric resistance near the separator is small and air and fuel gas can be supplied to the area covered with the gas channel structural members near the electrodes. 3 figs.  
IC H01M008-002; H01M004-086; H01M008-012  
CC \*300503  
CT DUCTS; ELECTRODES; FUEL CELLS; GAS FLOW; MECHANICAL STRUCTURES; POROUS MATERIALS; SOLID ELECTROLYTES; SURFACES  
\*FUEL CELLS: \*SOLID ELECTROLYTES; \*ELECTRODES: \*SURFACES; \*GAS FLOW: \*DUCTS  
BT DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; ELECTROLYTES; FLUID FLOW; MATERIALS

L98 ANSWER 10 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE  
AN 1989(21):143806 ENERGY  
TI A project for the electrochemical production and utilization of hydrogen in Brazil.  
AU Gonzalez, E.R.; Ticianelli, E.A.; Tanaka, A.A.; Avaca, L.A. (Instituto de Fisica e Quimica de Sao Carlos, USP, C.P. 369, 13560 - Sao Carlos - SP (BR)) [Brazil]  
SO Energy Sources (N.Y.) (1989) v. 11(1) p. 53-58  
CODEN: EGYSAO ISSN: 0090-8312  
DT Journal

CY United States

LA English

AB This paper describes the efforts of the Electrochemistry Group of the Institute of Physics and Chemistry/USP to develop electrode materials for water electrolyzers and of components for phosphoric acid fuel cells. In the last few years, several fundamental studies have been carried out in the electrocatalysis of water electrolysis reactions, particularly on hydrogen evolution, which allowed the development of materials with lower overpotentials, compared with those of conventional cathodes. In the phosphoric acid fuel cell area, substantial progress has been made in the development of teflon-bonded gas diffusion electrodes, bipolar separator plates, and electrolyte-containing matrices. These components have been tested in 50 W and 200 W phosphoric acid fuel cell modules.

CC \*300505; 080101; 320301

CT \*HYDROGEN PRODUCTION; \*FUEL CELLS: \*ELECTROCHEMISTRY; \*WATER: \*ELECTROLYSIS; \*BRAZIL: \*ENERGY SOURCES; BATTERY SEPARATORS; ELECTROCHEMICAL ENERGY CONVERSION; ELECTRODES; PHOSPHORIC ACID

BT CHEMISTRY; CONVERSION; DEVELOPING COUNTRIES; DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; ENERGY CONVERSION; HYDROGEN COMPOUNDS; INORGANIC ACIDS; LATIN AMERICA; LYSIS; OXYGEN COMPOUNDS; SOUTH AMERICA

L98 ANSWER 11 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE

AN 1989(8):46835 ENERGY

TI Heat and mass transfer in a molten carbonate fuel cell (Part 1). Experimental and analytical investigation of fuel cell temperature distribution.

AU Kobayashi, Nariyoshi; Fujimura, Hidekazu; Otsuka, Keizo (Hitachi Ltd., Tokyo, Japan) [Japan]

SO Nippon Kikai Gakkai Ronbunshu, B Hen (25 Sep 1988) v. 54(505) p. 2568-2574

CODEN: NKGBDD ISSN: 0387-5016

DT Journal

CY Japan

LA Japanese

AB The temperature distribution of a molten carbonate fuel cell coupled with the electrochemical reaction, was analyzed. The relationship between cell output and the temperature distribution was studied with the electric power generator. The stacked cells of 900cm<sup>2</sup>\*4 cells and 3,600cm<sup>2</sup>\*10 cells were used to confirm the effect of stacked cell number and cell size. The calorific power in the cell was determined by current density, voltage and cell temperature. Heat dissipation is composed of convectional heat transfer from electrode to gas of low Reynolds number, convectional heat transfer from separator to gas after contact heat conductivity and radiation heat transfer from electrode to separator, heat transfer accompanied with mass transfer of reaction and generation gases, and convectional and radiation heat transfer between cell side surface and atmosphere. These are modelled to analyze. The contact heat conduction between parts influenced greatly to the temperature distribution in the cell of stacked structure and low

gas flow. When the stacked cell number is large and the influence of upper and lower end temperature is low, the analyzed results agreed well with measurements, showing the proposed model is effective. (13 figs, 7 refs)

CC \*300500

CT \*MOLTEN CARBONATE FUEL CELLS: \*DIMENSIONS; \*MOLTEN CARBONATE FUEL CELLS: \*HEAT TRANSFER; \*MOLTEN CARBONATE FUEL CELLS: \*MASS TRANSFER; \*MOLTEN CARBONATE FUEL CELLS: \*STRATIFICATION; \*MOLTEN CARBONATE FUEL CELLS: \*TEMPERATURE DISTRIBUTION; BATTERY SEPARATORS; ELECTRODES; GAS FLOW; NUMERICAL ANALYSIS

BT DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; ENERGY TRANSFER; FLUID FLOW; FUEL CELLS; HIGH-TEMPERATURE FUEL CELLS; MATHEMATICS

L98 ANSWER 12 OF 13 ENERGY COPYRIGHT 2002 USDOE/IEA-ETDE

AN 1988(17) 139876 ENERGY

TI Fabrication of a solid oxide fuel cell monolithic structure.

AU McPheeters, C.C.; Fee, D.C.; Poeppel, R.B.; Claar, T.D.; Busch, D.E.; Flandermeyer, B.K.; Easler, T.E.; Dusek, J.T.; Picciolo, J.J. (Argonne National Lab., IL (USA)) [United States]

CS Courtesy Associates, Inc., Washington, DC (USA) (9505914)

NC W-31-109-ENG-38

NR CONF-861008--Absts.; DE88008298

SO 1986 fuel cell seminar: Program and abstracts.

Oct 1986. pp. 44-47 Availability: NTIS, PC A 17; 3.

Conference: Fuel cell seminar, Tucson, AZ, USA, 26 Oct 1986

DT Report Article; Conference

CY United States

LA English

DN ERA-13:045161

AB The monolithic fuel cell structure is a honeycomb-like structure with gas-flow passages built into the fuel and oxidant electrodes. The structure is comprised of the four solid-oxide fuel cell materials; electrolyte, anode, cathode, and interconnection. The gas channels in the electrodes have characteristic dimensions on the order of 1 to 2 mm. The Mod 1 design consists of alternating layers of anode electrolyte/cathode composite, which is corrugated, and cathode/interconnection/anode composite which is flat. Fuel and oxidant flow in alternate sections of the corrugation on opposite sides of the anode/electrolyte/cathode composite. This design provides a high power density because it has high electrolyte surface area per unit volume; however, the manifold arrangement for this design is relatively complex. The Mod 0 design consists of alternate flat layers of anode/electrolyte/cathode composites and cathode/interconnection/anode composites separated by corrugated anode and cathode layers to provide the fuel and oxidant flow passages. The anode and cathode corrugations are oriented at 900 apart to allow simple fuel and oxidant manifold design. The objective of this work is to develop the processes for fabrication of the Mod 0 Monolithic Fuel Cell, and to fabricate the first working fuel cells of this design.

CC \*300501

CT \*FUEL CELLS: \*FABRICATION; ANODES; CASTING; CATHODES; DEFECTS;

DESIGN; INSPECTION; OPERATION; OXIDES; POROUS MATERIALS; SOLID ELECTROLYTES; X-RAY RADIOGRAPHY

BT CHALCOGENIDES; DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; ELECTRODES; ELECTROLYTES; FABRICATION; INDUSTRIAL RADIOGRAPHY; MATERIALS; OXYGEN COMPOUNDS

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 AN 1982(18) 442310 ENERGY  
 TI Evaluation of natural gas molten carbonate fuel cell power plants. Final report 1 Mar 80-1 May 81.  
 AU King, J.M.; Levy, A.H.; Van Dine, L.L.; Wertheim, R.J. [United States]  
 CS United Technologies Corp., South Windsor, CT (USA). Power Systems Div. (9502039)  
 NR PB--82-181272; FCR--3522-2  
 Aug 1981. 157 p. Availability: NTIS, PC A08/MF A01.  
 DT Report  
 CY United States  
 LA English  
 AB Three advanced molten carbonate fuel cell power plant concepts designed to provide greater quantities of high quality reject heat show significant advantage over both advanced phosphoric acid systems and conventional molten carbonate systems for industrial cogeneration with natural gas. Cost and energy savings with the best system (internal reforming) are 20 and 15 percent respectively when compared to a conventional utility approach with purchased power. The other advanced systems - anode exhaust recycle through an adiabatic reformer and steam separator - also show significant savings. Technology goals and cell stack sizes are consistent with the objectives of other programs meeting both cost and endurance goals, all of which are important to the success of the industrial cogeneration application. The favorable characteristics of an internal reforming system are based on several technical assumptions which must be resolved. The industries for which the use of natural gas molten carbonate fuel cell power plants would provide greatest benefit are: chlorine, various paper products, alumina, nylon, polyethelyne, and polyvinyl chloride.

CC \*300502; 290800  
 CT \*FUEL CELL POWER PLANTS: \*COGENERATION; \*NATURAL GAS FUEL CELLS: \*COGENERATION; \*MOLTEN CARBONATE FUEL CELLS: \*COGENERATION; \*FUEL CELL POWER PLANTS: \*FEASIBILITY STUDIES; COST; DESIGN; ECONOMICS; EVALUATION; INDUSTRY; PROCESS HEAT; WASTE HEAT UTILIZATION

BT DEUS; DIRECT ENERGY CONVERTERS; ELECTROCHEMICAL CELLS; ENERGY; ENERGY SYSTEMS; FUEL CELLS; HEAT; HIGH-TEMPERATURE FUEL CELLS; POWER GENERATION; POWER PLANTS; STEAM GENERATION; WASTE PRODUCT UTILIZATION